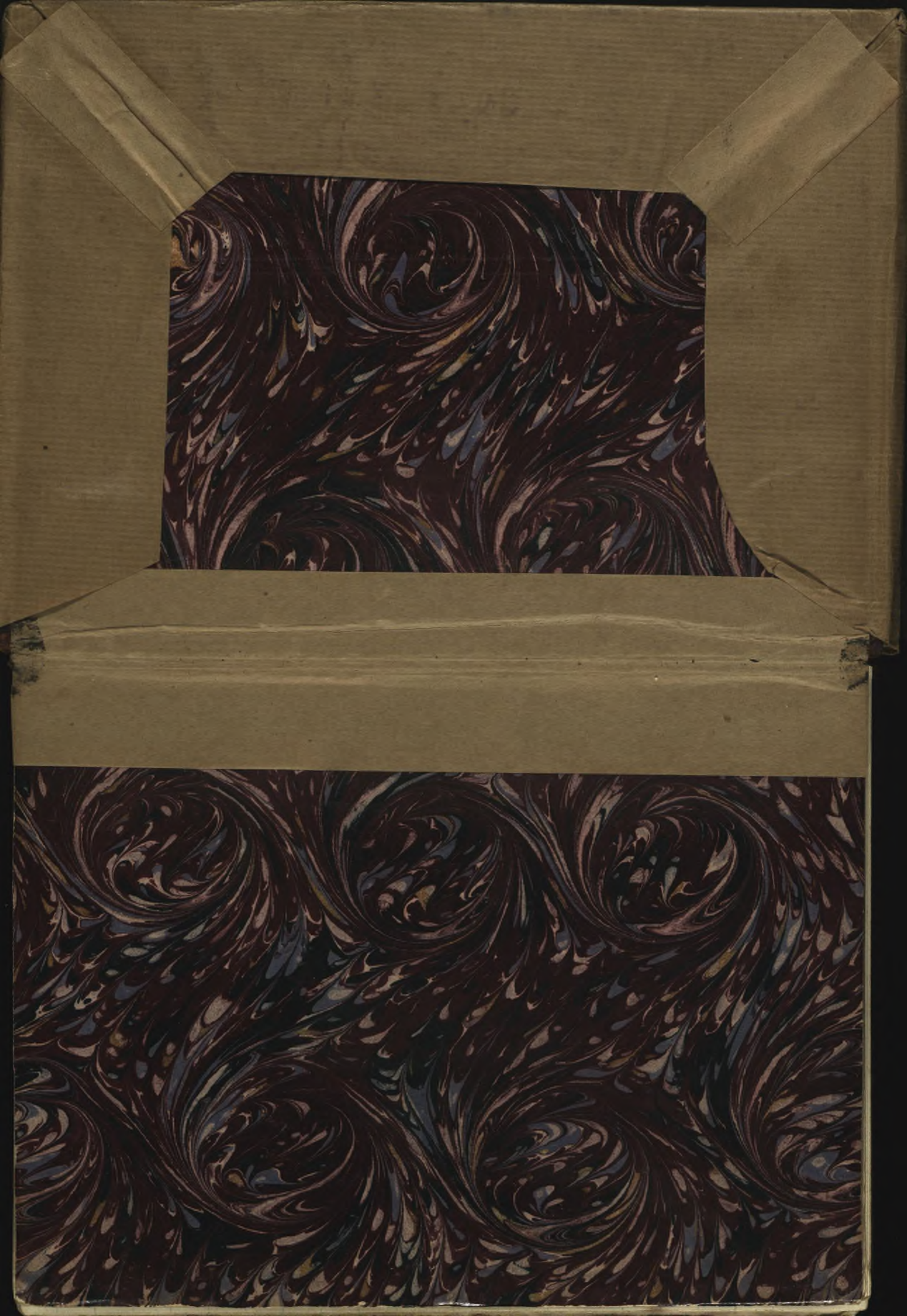

The
SCIENCE of CHANGE RINGING

by

J. Armiger Trollope

Hon. Member Central Council of Church
Bell Ringers.

with a foreword.
by.

Everard S. Powell M.A.
Vicar of Holbeton.

A.D. 1922.

Method Construction, which is the subject treated in the following pages, has been Mr. Trollope's special study for many years. It would indeed be hardly an exaggeration to say that he is almost alone among modern experts in this particular investigation. This statement will doubtless at first meet with the challenge of strong incredulity on the part of the reader. He will naturally recall the vast interest that the theory of bell ringing has inspired during recent years, and the enormous number of new Methods that have been discovered and published. A little further thought should make my meaning clearer and and perhaps convince the objector that the statement is not unjustified.

The contemporary expert has not altogether escaped the consequences of contact with an utilitarian age. His time and his labour have been expended on the composition of peals of record length or such as possess musical or other qualities never before obtained. His efforts to evolve new Methods or extensions of old Methods have been directed by the desire to discover something more interesting or more difficult to ring than has been previously available in the belfry. If in the course of his work he has given thought to the construction of Methods or the correct manner in which they may be theoretically extended this has been incidental and generally speaking subservient

to the practical side of the art. In other words he has concerned himself with concrete figures and abstract thought. Even at the moment when he is dealing with theory he is obsessed with the thought of practice, and as an almost inevitable result immediately his investigation brings him to a point where theory appears to conflict with practice he will be apt to drop the theory as useless. It may be a hard saying, but procedure such as I have outlined here bars the way absolutely against knowledge of the principles that underly the science of change-ringing, and so long as it is persisted in there can be no true vision. The trees block out the sight of the wood.

What then is it that Mr Trollope has done, or at any rate what has he tried to do? Wherein does his procedure differ from that of other authorities in modern times? Simply in this. He has put theory in the foreground. His mind has dwelt on abstractions rather than the concrete. Thus, for example, instead of experimenting with the figures of individual Methods to see where they will lead him, he has sought for the links that bind all Methods together, legitimate or illegitimate, regular or irregular.

It will be observed that he bases his reasoning on the axiomatic statement that all change-ringing consists of

relative movement. Some readers may be inclined to regard this axiom as a platitude of little meaning or worth. If they will consider seriously what it means and will follow consistently the road along which it takes them, they may probably find it difficult to deny the conclusions that are drawn from it in the following pages.

An objection that will rise to the minds of many readers consists in the occurrence of numerous examples of Methods that are unsuitable for practical ringing, either because they are unsymmetrical or on other accounts. But this objection falls to the ground when it is recognised why these particular

illustrations are chosen. Speaking generally Mr Trollope is not concerned in producing ringable Methods or ringable extensions of existing Methods, but in shewing the true principles of construction and extension. His purpose is to make known to the Exercise what may be called the scientific elements of which all Methods, legitimate or otherwise are compounded, and the ways in which a given set of figures on (say) 6 bells, these figures may or may not be extended in true Mathematical Series.

Arising out of this objection a further question may conceivably occur to the mind. Why bother about these useless Methods and Extensions at all? What we need are

Methods we can ring; we do not want to waste our time over so-called Methods that are of no practical value. The answer to this is that it is only by ignoring all accidental and artificial rules (such e.g. as that a bell must not strike more than 2 blows consecutively in one position) that the real foundations of change-ringing can be unearthed. When this process has been performed, it will become a comparatively simple business to select the Method or the Extension for practice in the Tower.

The importance of arriving at a sound conclusion on the actual foundations of change-ringing will be denied by no intelligent reader

If Mr Trollope is right, the consequences must be far reaching. Henceforth an acid test will be available to settle definitively whether (so say) figures put forth as purporting to be Superlative Maximus are or are not a true extension of the Major. What is called the Bob Major Lead End will cease to be the subject of rancorous debate, and many other problems will receive their appropriate solution.

One further warning note must be struck. There are two ways in which the questions dealt with here can be approached. They can be worked out <u>deductively</u> after the manner of the Mathematician, or they can be argued as the logician argues in accordance

with <u>inductive</u> reasoning. The latter is Mr Trollope's method. And it is just because most ringing experts try - with greater or less success - to follow the mathematician's methods that the caution is needed. Every one knows that if in a chain of mathematical or deductive reasoning a single link gives way the whole is naught; and those whose training has been on the lines of the mathematician or natural scientist are prone to imagine that the same thing must apply to every kind of argument. But this is by no means necessarily the case where the reasoning is inductive.

Of this an excellent example

is the case in the Law Courts built upon what is known as circumstantial evidence. So far from it being essential that every single item of testimony should be true, it may even conceivably happen that there is no one single piece of evidence which taken by itself is vital. The conclusiveness of the case presented depends on the evidence as a whole, so that taking it all in all no other verdict is reasonably possible.

The reader may and probably will find isolated statements in the following pages whose truth he is tempted to doubt. He is not on that account to be unduly critical. Still less must he thereupon condemn the whole. It is

only after he has read the complete argument and grasped its bearing in all respects that he will be able to form a sound judgment on its constituent parts.

When he has reached this stage I would ask him to put two questions to himself. First, is there or is there not an inner unity whereby ringing is bound together in a single science, and secondly, if there be such unity can it be of a different character speaking generally from that which is set out in the pages of this book?

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For Stedman read
Richard Duckworth 1668
who first discovered the true
authorship of the Tintinnalogia

TINTINNALOGIA P1. Stedman, I take it, uses the word "invented" in its original meaning i.e. as the equivalent of introduced and not, as is common today, as practically the same thing as "created"

cf. SHAKESPEARE'S Henry IV ii Act III, Sc II.

The Science of Change Ringing.

Chapter I The Axiom

The beginning of ringing was natural and spontaneous; it was in no sense the invention of one man or one band. Exactly when it happened we do not know, but by the middle of the XVI th century it was practised in many parts of England. The earliest date is that of the "invention" of the Sixes which Stedman says took place about 1600. Thence forward development was steady and continuous

And the beginning of ringing was not among educated or particularly intellectual men. It sprang up among the common people of widely scattered towns and villages. Such people, as a class could neither read nor write, and means of personal communication between

I know now a good deal
more about singing history.
Stage singing was invented probably
at the Universities and Inns of Court.

12th of 22nd Henry. VIII ; 25th of 27th Henry VIII
1st Edward VI also other Acts of Ed VI and Elizabeth.
See Froude J.R.Green etc.

places separated by more than the shortest distances were so scanty as, to be for the great majority of men practically nonexistant. Stage coaches, to say nothing of railway trains, were as yet unknown; the badness of all but a few main roads precluded all vehicular traffic; to ride horseback was the privilege of the few; the many had perforce to go afoot. Nor were there the only deterrents to travel. Savage vagrancy Acts forbade anything like free migration of labour from place to place; while a "host of broken men" and "sturdy beggars", in the wake of the result of the social religious, and political changes of the time infested the highways and made travel dangerous and precarious.

In these days of railway trains, cycles and motors; of daily almost hourly posts; of associations and guilds; of frequent meetings and combined practices; with a weekly singing newspaper and a Central Council; when singers in all parts of the country can look on each other as personal aquaintances and friends; when the Exercise is in reality

a unity – in these days it is rather difficult to grasp the idea of an Exercise consisting of independent and isolated units, where each tower, or perhaps each small group of towers, had to learn and develop its ringing by its own abilities and without any aid from outsiders

It was, however, in such an Exercise that ringing began. And the remarkable fact is that, begun in this fashion, it was always the same thing. From small beginnings developments started here more rapidly, there slower; but the developments were always in exactly the same direction. Not only so, but great as has been the development during the last three centuries ringing has throughout remained essentially the same thing. There are two great landmarks in its development. The first is the "invention of the Sixes." somewhere about 1600; the other is the introduction of Cross Peals rather less than a hundred years later. Once the Exercise had reached these points it did not go back again. But from 1700 not

"Tintinnalogia" page 44. "Cross Peals" were known in 1667 and probably some years before. Plain Changes were abandoned by advanced ringers not many years later and died out except in the degraded form of Call Changes. Note that

Plain Changes were strictly scientific in their structure and contain the gems of all modern Method and peal Composition

Note "Cross Peals" was the original term used for Ringing in which every bell is continually moving in contradistinction to Plain Changes in which one pair of bells only is changed at a time.

I should have written the word "principle" instead of "idea" but that "principle" is used in ringing with a technical meaning and it is well to avoid any chance of confusion.

only is the general character of ringing unalterably fixed, but the Standard Methods, in which more than nine-tenths of ringing is done, are fixed, also and there is no likelihood whatever that any change or further development will, or can, displace them.

If by any chance one of John Gathom's band could once again find himself in the city of Norwich he would, even in that city, which more than any other has preserved outward links with the past, find himself in an absolutely new world. Only when once more he entered Mancroft belfry would he be at home. Gone indeed are the bells he knew, but he could still take his rope in Plain Bob or Grandsire or Stedman or Treble Bob just as he did more than five hundred years ago.

Now all this points conclusively and inevitably to one thing. There must have been, and there must be, one simple obvious and strong idea at the root of ringing which could thus create and develop in one strait fixed path. Simple and obvious to appeal to

"A Change is made between two Bells that strikes next to each other by removing into each others

appeal unconsciously to ordinary unlettered men. Strong enough to override all other ideas, to be proof against all changes of time, and different men's fancies. Alive enough to develop ringing from small beginnings to a complex science!

Such an idea must have its foundation in some great principle of natural law and it and it alone can supply the axioms on which we must build up the Science of Ringing.

Originally ringing was in England what it still is in France and other countries, the more or less promiscuous sounding of bells without much regard for either time or tune. From this it developed into a kind of sport, the attraction of the sport consisting in the strength and skill required to ring bells "up" with the faulty and imperfect hangings. This, naturally, produced "round ringing" and developed a sense of rhythm and good striking. Then there came the time when, in different parts of the country, if one ringer said to another in so many words "Let's have some variety. Change places with me." And, at the moment that was said, change ringing,

places" Sledman "Tintinnalogia" page 3.

See Article Bell News. Sep 15. 1915 by. J.A.T.

For a fuller account of Sledmans book and teaching see Articles in Bell News Sep 15 1915 etc seq.

with all its possibilities and all its limitations was born. "Change places with me" — that is the real idea of change-ringing. The idea is essentially one of movement, the movement of the bells among each other, and it is this idea of movement that all along has, and still does, dominate both the science and the art.

But it may be objected that this account of the beginning of ringing, although very plausible and very possibly true, is after all only conjecture. That is true; but we are almost at once on the pure ground of historical fact. The first completed step in the development of change-ringing was as Sledman tells us the "invention of the Slices." And Sledman not only tells us what the Slices are, and how they can be rung, but how actually they were rung. This enables us to argue one step backwards and turns our conjecture into a certainty

Further Sledmans tells us how the idea of movement, which first produced the Slices, continued to develope change ringing, and the reader who wishes to understand what ringing is and how it

inevitably came to be what it is today cannot do better than study carefully the first part of the Tintinnalogia, that part which deals with Plain Changes. Stedmans testimony is invaluable because he wrote at a time when the idea of movement had shown what it was capable of in the way of development and before more complete development had obscured that idea in the minds of composers. Moreover Stedman was better fitted intellectually, to write on ringing as a whole than almost any man who has ever written about ringing.

The real idea of the Tintinnalogia is that movement of the bells is the principle on which ringing is based — not the particular rods which are rung. Unless this is fully grasped the book is unintelligible

And now just for a moment consider the terms and phrases that always have been, and still are, used in practical ringing. Hunting, Dodging, Place-making, Leading, Lying, Snapping, Coursing, Bob, Whole Turn, Half Turn, Course, Lead, and the rest. Practically every one implies movement. These terms were

invented naturally and spontaneously by singers because they describe, and in some part explain, the things they refer to. A singer naturally talks about hunting, because the idea in his mind is movement, one bell following another. He naturally talks about dodging, because the idea in his mind is that of a backward step in a forward path. He naturally talks of a race, for the idea in his mind is that of a definite stage in his journey. And so with the others.

And this testimony of terms has not only positive value, but also negative value. All the terms imply movement. They do not imply anything else. If the root idea of singing were music we should expect terms with a musical significance; but such are conspicuous only by their absence. It is quite remarkable that the word "real" which in ordinary language has a musical meaning, should in singing have a technical meaning with which music has nothing to do!

Still more noteworthy is the fact that

See Article on "Rows and Changes"
Bell news Mar 27 1915.

these terms which are so much occupied with the Changes, have so little to do with the Rows. The ordinary modern composer is almost exclusively concerned with the Rows. He treats the Changes almost as if they were the result of the Rows. Historical Change Ringing reversed the process. The Changes (i.e. the movement) are the all important thing; the Rows are the result, the actual Rows being a comparatively unimportant result.

And this idea of movement is still the dominant idea of practical ringing. When we go into the tower to ring a peal we do not go with the idea of ringing any particular Row. We go with the idea of ringing a particular method, i.e. so much particular work or movement. What Rows we ring we probably never know. We do know that we do so much dodging, and place making. Just listen to a band discussing any bit of ringing. Their talk is almost entirely of movement. "You stopped up too long behind, you ought to have come down before the

tenor" "When I got into 5-6 there was no one there to dodge with me" "The third left the slow 60 soon" Anybody can multiply such instances from his own experience. When you are sitting down by yourself with pencil and paper, no doubt a method naturally appears to you as a collection of figures, a series of Rows. But when you are in the tower it is quite different. There ringing consists of a certain number of bells making more or less intricate movements among themselves, like dancers in a set dance, or soldiers in drill movements. Different formations are constantly being produced, but the one essential thing is the movement which produces the different formations. So much is this true of ringing that the ringer looks on himself and talks of himself as one personally engaged in a journey. He says "I was in 5-6" "I was at the Lead", "I was behind"; not I struck my bell in sixths or the front or behind.

Now you cannot divorce theoretical ringing from practical ringing. They

Rev. H Law James Bell News Jan 14. 1914.

are two sides of the same thing. No doubt there are many problems of theoretic ringing which must be settled in the study and not in the tower such problems as the Composing of true peals. No doubt it is easier and apparently more satisfactory to take a method as a concrete set of figures and "follow where the figures lead you" You will find many interesting probems but you will not necessarily find out the truth about ringing. For a method is a thing which belongs to the tower and to practical ringing. If we are to understand problems of Method Construction and Extension we must first find out what the method is in the tower, and rigorously exclude all other considerations and theories. Two and a half centuries ago Stedman showed how it can be done, and his book can well serve as a model.

We reach then the conclusion that our axiom must be that Change-Ringing is movement among the

Bells which produces different Rows. Our present task is to investigate the nature of this movement and the different laws and rules which govern it.

Note.

I do not wish to convey the idea that all early ringers were illiterate. By the middle of the XVII century it obviously was not so. Stedman was a man who could write good English, and the fact that he published two books on ringing shows that there must have been quite a number of readers. The Norwich men, Melchior and Crane, could write lively controversial letters. Annable's M.S.S shows him to have been a practiced penman.

Still my point remains, that singing began and its destiny was fixed among the unlettered, in obscure country villages equally as in the towns. And it must be remembered that the first book the Sentinmalogia does not profess to give anything new, but describes and explains and reduces to system order singing as it was already practised

Chapter II

The Postulate

The one postulate in the science of Change-ringing is the Bell

A Bell is an abstract entity which has no qualities other than Identity and Relative Position

When, speaking of a Method, either in reference to practical or theoretical ringing, you talk of a bell, you do not mean a musical instrument weighing so many hundredweights and giving forth a particular note. You mean something quite different, which is abstract, and which is expressed to your mind in several different ways. When you are dealing with pencil and paper it is expressed by one of several figures, or letters, or sometimes by a continuous line. You call these figures and letters the bells but you know quite well that they are only symbols which stand

for a something behind them. When you are in the tower the bell is expressed to your ~~bell~~ mind, through your hearing, by the sound of the bell above. Much more frequently and really, (since ringing is a thing of sight rather than of hearing), it is expressed through your eyes by the rope and the ringer who is pulling it. The ringer identifies himself with the bell he is ringing. It is he that is the expression of the abstract bell. It is he that hunts and dodges and makes places, not the material bell in the chamber above him, which is merely an instrument which records what he is doing.

Now although the expressions of the bell thus differ in varying circumstances, it is always essentially the same thing and always abstract. It bears to the science of Change Ringing the same relation that Euclid's "point" does to the science of geometry. In fact it is almost the exact equivalent of the other. As you must think of the point to understand geometry so you must think of the bell to understand.

The science of Change Ringing.

At different times and under different circumstances the bell acquires different qualities. When you are dealing with music in connection with singing, the abstract bell acquires musical qualities, and the symbols 12345678 may stand for a definite musical sequence. Or when you are dealing with the construction of Methods or Peals a bell may become a Hunt or an Observation Bell. But these qualities are acquired and not inherent. The only inherent qualities are identity and relative position.

A bell always keeps its own identity; from first to last of a Course or a Peal it is the same thing, not like two occurances of the same note in a piece of music which have nothing, necessarily, to do with each other.

From this quality of identity and from the idea of movement we get the first of the great Laws of Change Ringing viz that a bell may move up or down only one step at a time.

It is inconceivable that any thing that has identity, whether it be abstract or

Rev. C.D.P. Davies Bell. News. 1915.

material, can have occupied one position at one time and another at another time, without having passed through connected intervening positions. The earliest ringers having conceived (of course unconsciously) the idea of the movement of an individual bell, the idea of that bell moving in a connected path followed as a logical necessity, and remains to this day the foundation of all ringing. And a connected path naturally implies to most minds the rule that a bell in, say, thirds may move into seconds or into fourths, but may not, indeed cannot, move into fifths or sixths in one step. Hence this rule has always been observed by the Exercise with but two attempts (to be noticed later) in the early days to break it, and none for practically two hundred years.

To a man who is writing in his study it may seem true to say that "it would be possible to ring changes in almost any fashion but that scientific ringers have agreed to bind themselves by certain rules which

Stedman "Tintinnalogia" p. 3.

regarded by them as being fundamental and which are never transgressed except for grave and sufficient reason," but the idea implied has no foundation in historical facts. In totally different circumstances perhaps it might have been possible "to ring changes in almost any fashion" but directly change ringing began by two bells "removing into each others places" all the fundamental rules like the one we are considering had to follow by logical necessity. As for any agreement between ringers to find themselves there never was any opportunity for such a thing even if there had been any disposition to do so, which may well be doubted.

I have mentioned two early attempts to break the rule that a bell may not move up or down more than one step at a time. One is referred to in the Glossary as Jumping Doubles. Now to jump implies movement and it also implies a connected path. But it also implies a path which passes over, and not touching, a particular point or position. From the word as can gather

Stedman Tintinnalogia p. 80

Tintinnalogia p 103.

what was in the mind of the men who invented this particular form of ringing. They never thought of questioning the idea of movement as the one essential thing in Change Ringing. They took it as their axiom. But they tried to see how that idea could be developed in a new direction. The attempt is a most interesting one. It failed because to ordinary minds, as I have said, a continuous path involves a bell passing from one position to the next and not over it.

The other case is that of Grandsire Triples. This was an attempt by R.R. "the author of Grandsire Bob" to obtain a 120 of Grandsire Doubles without Singles. This was done "by moving the bell which lies in thirds place down under two bells at once into the fifths place; or else by moving the bell in fifths place up into thirds place." A similar attempt was made to produce a 720 of Bob Minor without Singles — "The Seven-hundred and twenty changes of Grandsire Bob may be Rang without making any single change therein,

which way y Ringing it, is call'd Grandsire Bob True ... At the first bob-change of any double bob, it may be made, by moving the Bell in fourths place down under five Bells at once into the seconds place ...."

Here again the root idea y the bells moving in a continuous path is carefully kept. If we had merely the figures, the rows, we should naturally assume that the rule that a bell may move only one step at a time was an arbitrary rule agreed to by ringers. Fortunately we can see what was in the minds y the ancients, and can understand how it came about as a necessary, logical result y the first simple idea y movement.

The second inherent quality y the Bell is position.

Movement implies varying position and the different positions are the measure y what movement has taken place. But the Bell is an abstract conception, not conditioned by material ideas y time and space. The position y a bell is therefore relative, and

is relative to the position of the other bells and to nothing else. It is not, for instance, relative to the piece of paper on which you write out rows, though that is the relation which most readily suggests itself. Even in material things position is relative; we judge the position of town by its relation to other towns or to some natural geographical feature. But while every material thing has a positional relation to every other material thing, a bell which is abstract is outside that relationship

The question of relativity is a very important one in the Science of Change-ringing. Many of the fallacies that are widely held by people about such things as variation, extension, and the like are due to the fact that it is not sufficiently understood.

A Row is a succession of Bells.

It follows from what I have already said that the only inherent qualities in a Row are identity and its

See also. Bell News. Dec 11 1915

position relative to other Rows.

A Row consists of a definite number of bells in a definite order. The figures 12345678 may stand for any row. But once you apply them to a particular row, then 21436587 or 13572468 or any other permutation is only applicable to a row which bears a definite relationship to the first row. This relationship is the result of the movement of the bells and is the measure of the movement.

A Change is the movement between two rows and the means by which row is produced from row

12345678
21436587

These figures represent two rows but only one change.

This distinction between rows and changes is important and historical. The ringing we are dealing with is

change ringing not row ringing. The important thing is not what you ring, not the rows — they are results; but the method by which you ring, the movement, the hunting dodging and place-making.

It is in the changes that we must look for the essentials of ringing. It is there that we shall find the laws of the science and the solution of such problems as Method Construction Extension, Bob Major Lead Ends, and the like.

To Stedman and the ancients, the value of the row was only in its making the change. You could ring a row as many times as you pleased; but you were not allowed, any more than at present, to repeat a change. The first Method and real composition consisted of different arrangements of hunts. As composition became freer and more complex it naturally developed into different arrangements of rows. The term change at first included the resulting row. Then it was used indiscriminately for

either. Later still, in composition it was almost exclusively used to mean the row only. Until in quite recent times the term "row" was invented, and the term change practically relegated to the lower. This shows how the relative values of the change and the row have altered in the minds of composers. This of course is quite natural; for problems of real composition are best settled by investigating the laws by which rows are joined together. The movement, which is the changes, is implied in the method which is taken for granted.

When however we are considering the Science of Change Ringing as a whole and the Laws of Method Construction Extension, and such like, we must go back and give again to the changes the importance they have never lost in practical ringing

Chapter III

The Nature of Movement.

At the base of Change Ringing we have a given number of Bells arranged in a Row. We have to produce other rows by interchanging the bells among each other. The Bells move like dancers in a set dance, or soldiers in a complex drill movement, constantly producing fresh formations. The number of formations, that is the number of rows, is, as every body knows, fixed. With five bells you have one hundred and twenty rows, no more and no less. With six bells you have seven hundred and twenty rows, and so on. But while every body recognises this fact, they, as a general rule, assume that the movement which produces these rows is subject to no general law. Of course they know that you cannot produce say the row 13572468 direct from 12345678.

They know by experience that you cannot produce the extent of Doubles without at least two Singles. They know pretty well the Law of the In and out of Course of the Changes, (though for very many years this was treated as a fact that could be recognised but at the same time a mystery that could hardly be explained.) But, generally speaking, ringers have assumed that apart from certain obvious limitations you could put rows together pretty much as you pleased. Methods were the results of mens fancies and conditioned only by certain "Conventions" which ringers tacitly agreed to conform to. That a crude touch of Stoney should be an expression of Law would seem absurd; and even for Methods which clearly show design in their construction our leading composers hold that each has its own Laws which do not necessarily apply to another.

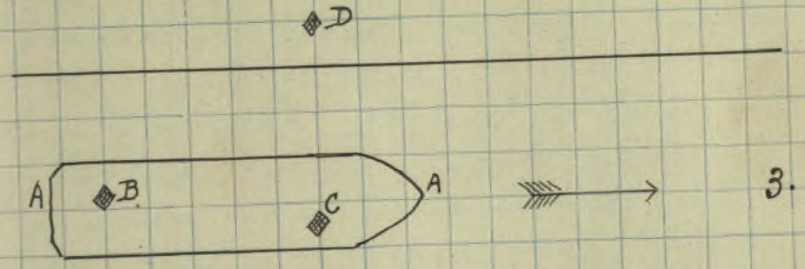
My present purpose is to show that once the idea is accepted that ringing is movement of the bells by which row is produced from row,

Then a general natural law becomes operative which controls all Method Construction, and which settles such questions as Extension and the like. To understand this law we must consider the nature of the movement

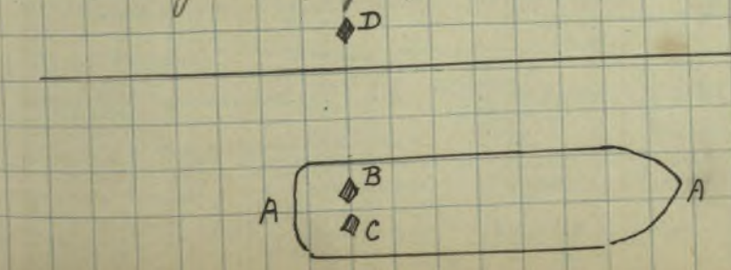
A. The Relativity of Movement.

All movement is relative. This is true of material things. When in ordinary affairs you think of speed or movement you always have in your mind some relation by which you judge that movement and you exclude all other relationships. If you walk quickly across the deck of a steamer you do not take into consideration the speed that the steamer is moving at. If you talk of an express train you do not think of the pace at which the earth is travelling round the sun. Yet of course the man is moving with the steamer, and the train is moving with the earth. Movement really means nothing more than that

the relative positions of two or more things are altered



Suppose that AA represents the deck of a steamer moving forward at the rate of four miles an hour. At B a man, we will call John is sitting in a chair. At C another man James is standing. And at D a third man, Charles is sitting on a log on the quay alongside which the steamer is moving. When the steamer gets into this position James walks along the deck towards John at the rate of four miles an hour, and directly he reaches him the steamer and the three men are in the following positions



Which of the three men has moved?
James would say "of course I moved.
I wanted to speak to John and, as
he was sitting still, I had to walk
down the deck to get to him." But
if he had looked to the right of him
he would have found himself all the
time opposite Charles; and Charles
too was sitting still. John was
quite comfortable in his chair, but
as he was watching the people on the
quay, he was quite sure in his mind
that he was moving. Charles was
sitting still on terra firma, but he
happened to be thinking of astronomy
and he was calculating the exact rate
he supposed the sun with earth "and
all which it inherit" was travelling
toward Sirius or some other "fixed"
star, which he knew was anything
but fixed.

Each of these men was thinking of
movement and each had for the
~~three~~ moment a different standard
to judge movement by. James was
thinking of himself and John: all
other relationships he ignored. John

was thinking of the steamer and the quay; he too ignored other relationships. Charles was thinking of the movement of solar bodies; and he too ignored other relationships. Relatively to Charles, James has not moved. Relatively to the steamer, John has not moved. Relatively to the quay, Charles has not moved.

Now try and imagine that John is relative in position to James, and James to John, and that all other relationships are utterly done away with. What should we find? Why that both John and James had moved, and moved in exactly equal proportion.

Bells are abstract entities, and by our postulate their positions are relative to each other, and to nothing else. They are not material, and therefore their movement is not relative to any material thing. Movement of a bell does not mean altering the position of a figure on a piece of paper. It means that the position of one bell relative to the position of

another bell is altered.

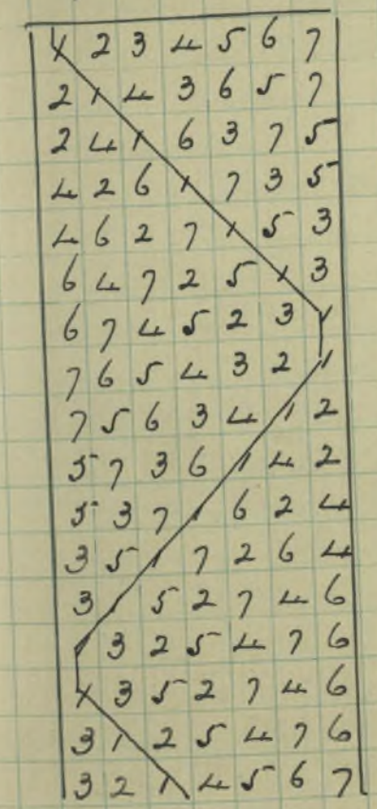
1	2	3	4
2	1	4	3
2	4	1	3
4	2	3	1
4	3	2	1

In the first change the 2nd moves from 2nds to the lead and his relative position to the other bells is altered. In the second change it leads again; but since the treble at the same time moves into 3rds and the 4th into 2nds, the relative position of the 2nd also is altered. Therefore the whole pull on the front is as much movement as any other part of Hunting.

This is true of all Place Making. Place-making is not an exception to movement but an integral part of it. Places are not something different from Hunting, but the form Hunting takes in particular circumstances.

And what is true of Places is also true of cases where one bell appears to lie idle in one position for a number of blows. There are always the results of movement and not of lack of movement. For instance the four blows behind in Plain Bob

Triples



All the bells are moving forward and this forward movement includes whole pulls before and behind. When the treble leads the other bells have to make one step backwards. The forward path of the sixth has caused it to lie a whole pull behind. If the next step were forward it would bring the bell into 6ths. But a backward step is required which causes another whole pull behind. Then the forward movement is resumed and that causes a third whole pull. Hence the four blows in 7ths.

*

Similarly we shall find that in many cases the result of movement is that one or more bells will remain for quite a long time in one position.

* 4.

3 1 5 2 7 4 6 ← 1st Whole pull
1 3 2 5 4 7 6 ← 2nd Whole pull
1 2 5 2 7 4 6 ← 3rd Whole pull
3 1 2 5 4 7 6

So long as the positional relationship of a bell is altered towards any other bell you have movement, and the laws which control movement are fully operative.

I am not concerned for the moment with the question as to whether any Method in which a bell lies for more than two consecutive blows in any one position is suitable for practical ringing. That will be dealt with at the proper time. All we can say at present is, that the fundamental Laws of Method Construction make no distinction. The same Construction which gives Plain Bob on an odd number of Extreme Bells without four consecutive blows, gives Plain Bob on an even number of Extreme Bells with four consecutive blows.

Knowledge of the relativity of movement will enable us to correct some false or exaggerated ideas of the position and value of Places in Method Construction which are widely held. In many men's opinion Places are the one essential thing in Construction. They

are the causes of which all sounding, dodging and other work are the results. Get your places right and all else will follow as a matter of course. Now it is quite true that a most convenient way of analysing a Method is by the Places. It is generally true also that if the Places are correct, the other work will be correct too. But it is not true that Places are the cause of sounding and dodging. Places are a part of movement equally with other work. Any theory which assumes that they are superior to or essentially different from other work is founded on a fallacy.

Sir Arthur Heywood on more than one occasion laid it down as an axiom of Method Construction that "every Bell that can, must change its place at each blow." In so far as this is a recognition of movement as the essential thing in ringing, we shall of course agree with it. In so far as it is a standard to which good methods should attain, it does not at this

point concern us. But as an axiom of the science of ringing it is based on two fallacies. The first is that Places are not movement, but the negation of movement. The second is that Places, or at any rate more than the minimum number of Places, are in themselves undesirable things. It is pointed out that with an even number of bells you must have two Places in every alternate change. With an odd number of bells you must have one Place in every Change. "Less Place-making than this is not possible; more is not necessary." * And consequently while Superlative is the ideal in Construction Cambridge is "crude" and "radically bad" and even Kent Treble Bob and London are not legitimate.

About this opinion it is only necessary to say that it is not supported by anything in the historical use and development of change ringing, and is contradicted by modern experience. So long as you keep to the minimum

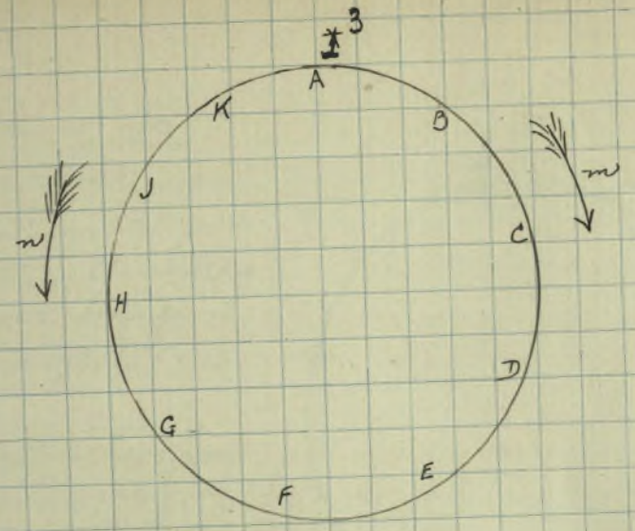
*Sir Arthur Heywood.

number of Places, you preserve a regular succession of Odd and Even Rows. No one who knows anything about peal Composition will deny the importance of having odd and even rows in due proportion and in due order. But a few men go much further, notably the Rev C.O.P. Davies and make this regular succession into a fundamental rule; so that the reverend gentlemen could "assert that Kent, London, Cambridge and Bristol are illegitimate and are so obviously illegitimate that there is no possibility of questioning the fact."

I however do "question the fact" and not I only but the whole Exercise. This "fundamental rule" is fundamental only in the mind of one or two men. Our present business is not to invent rules to which we think Methods ought to conform, but to find out the laws to which they do actually conform.

B - The Cyclical Nature of Movement.

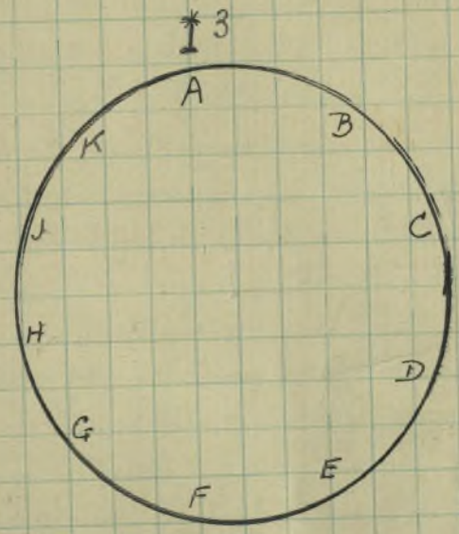
All Movement in Change Ringing is cyclical in form. It is movement which takes a bell from a point, and at the same time, tends to return it back again to the same point. It is movement which takes the bells from a row, and at the same time is bringing them back again to the same row. Every collection of rows produced by Change Ringing is not necessarily a Round Block; but every collection, whether produced by the most complex of Methods or by the crudest bit of Stedman, is necessarily in Round Block form, and is either a Round Block or part of a Round Block. There is no exception. Upon this point hangs all the science of Change Ringing.



Let ADG be a circle, and 3 an object stationed on the circle at A. Suppose you want to move 3 along ADG. You can do so in one of two directions. Either you can move it from left to right in the direction of the arrow m. Or you can move it from right to left in the direction of the arrow m. You have no third choice.

If you move 3 from left to right you will move it through BCDEF G and if the movement is continued you will ultimately reach A again.

Similarly, if you move it from right to left, you will move it K. J. H



and, if the movement is continued, you will ultimately reach A again through G F E D C B.

But when you are moving 3 from left to right you can, after you have reached any point, reverse the direction of the movement, and move 3 from right to left. Suppose you have reached C; you now reverse the direction. What happens? If you continue the reversed movement 3 passes again through B and again reaches A. It has now travelled forward and backward along an arc of the circle.

Again, suppose you move 3 from left to right until you reach any point D. Now reverse the movement which will be toward A through C and B. Before you reach A, at the point

B again reverse the movement. After the second reversal the movement is forward A through. EHK and if it is continued will ultimately reach A. Similarly however many times you reverse the movement it is always forward A either through the complete circle or else ~~backwards~~ forward and then backward along an arc of the circle. Further every reversal involves 2 travelling from some point of the circle along an arc of the circle and back along the same arc to the same point. No movement is possible which is not included in the above.

This exactly illustrates the movement of a bell in ringing. It is definitely restricted to the circle and the arc and because it is so restricted we can definitely calculate it.

In setting down the movement of a bell on paper we could use circles to illustrate it; but we have more than one bell to deal with, and it is convenient to stick to the ordinary straight line diagrams

Bear in mind however that a circle which shows the Places in exactly the same form as the rest of the Ringing is so far, a better illustration of the real nature of the movement than a diagram with straight lines and Places shown by vertical lines.

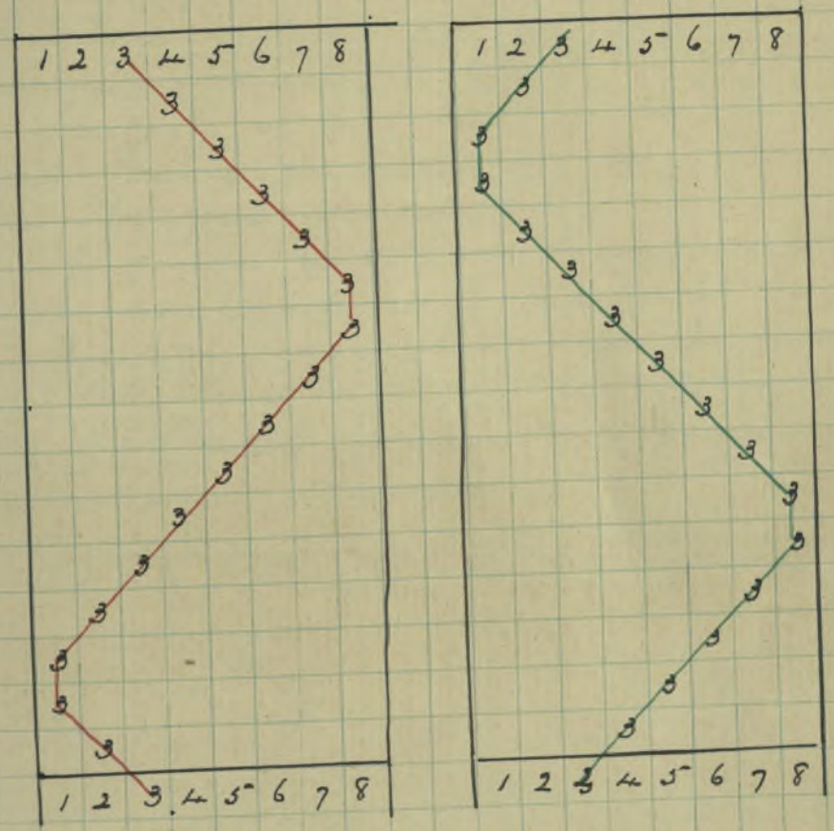
Let 12345678 be any Row consisting of any one number of Bells, and 3 be any one Bell in that Row.

3 can change positions with either the Bell in front of it -2- or the Bell behind it -4-; but with no other Bell.

If 3 changes position with 4 it moves into fourths place and a cyclical movement is begun which tends to return 3 back to the position from which it started; and will do so unless the movement is interrupted

Similarly if 3 changes position with 2 it moves into seconds place and a cyclical movement is begun which tends to return 3 back to the position from which it started; and will do so unless the movement is interrupted

Thus:—



These two movements are exactly similar to each other except in direction - one is the opposite of the other.

The first we will call Forward or + Movement

The second we will call Backward or - Movement.

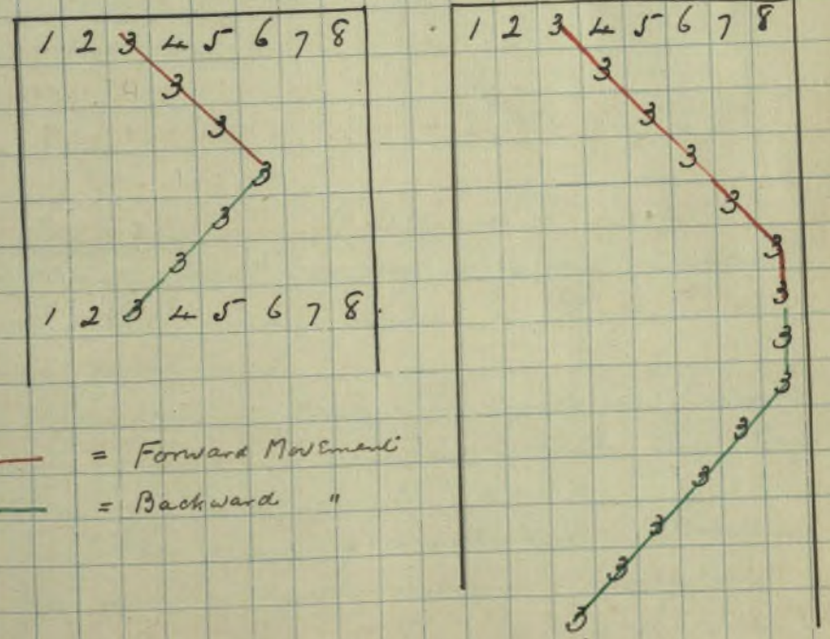
Interruption of this cycle can take

place in one of his ways only.

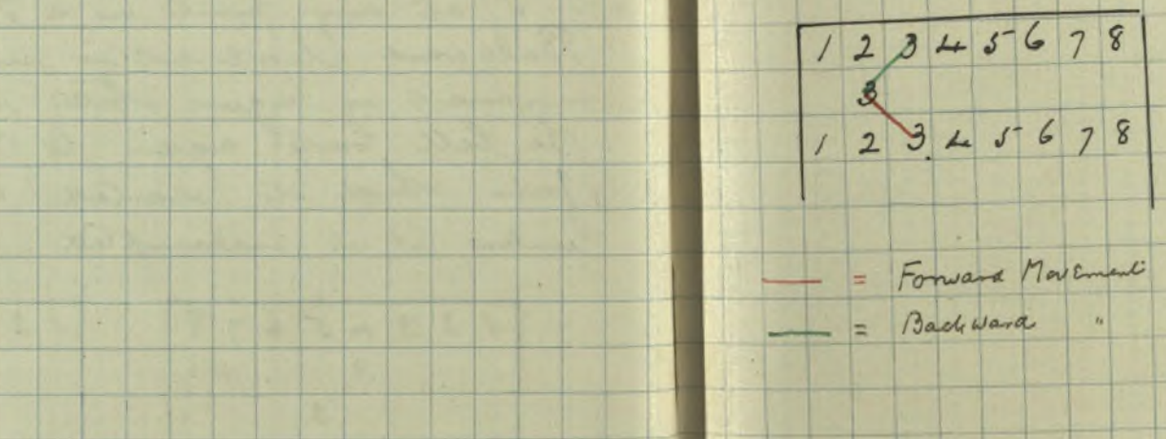
First at any point in the first cycle Backward Movement can be substituted for Forward Movement.

Similarly, at any point in the second cycle Forward Movement can be substituted for Backward Movement.

A. If at any point in a Forward Cycle Backward Movement is substituted, a movement is begun which tends to take the bell back again to the position from which it started and will do so unless it is interrupted.



Similarly if at any point of a Backward Cycle, Forward movement is substituted, a movement is begun, which tends to take the bell back again to the position from which it started; and will do so unless it is interrupted

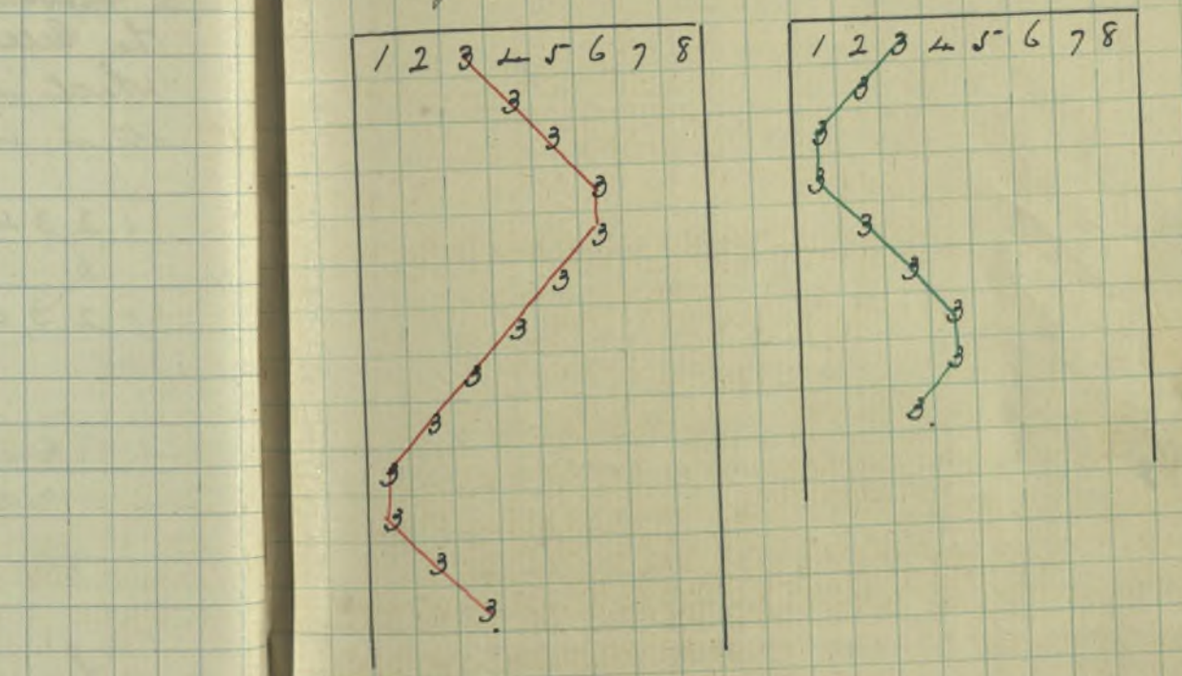


B. Secondly. A bell which starts a cyclical path among a given number of other bells may make a Place in any one position.

When this is done the cycle is turned into one on a number of bells less than that of the original one.

If the starting movement is Forward this smaller cycle remains throughout Forward. and if the starting movement

is Backward the smaller cycle remains throughout Backward.



When as explained in par. A. page 43 the movement of a bell consists of x steps of Forward movement followed by x steps of Backward movement, the bell moves Forward and backward along the arc of a cycle. This may be called a Dodging Movement. Similarly with x steps of Backward movement followed by x steps of Forward movement.

Interruption of a Dodging Movement can only take place by substituting Forward Movement at any one point for Backward Movement (or vice versa);

or, by the introduction of a cycle of less number of bells than those of the original row. (as explained par B. p. 44.).

In either case the movement tends to return the bell to the position from which it started.

It follows that no matter how you write out changes, the path of a single bell will consist of a number of complete cycles of (perhaps) different sizes and sometimes with the addition of a number of Dodging Movements of different sizes.

Also that all movements and all combinations of movements tend to return the bell to the position from which it started. And will do so unless either (a) the bell perpetually works in a cycle which does not include the original position or (b) it, by means of Dodging Movements, oscillates between two points.

In Change Ringing these two cases are ruled out by the Law which forbids

Note that the distinction is between Forward and Backward Movement, not between Upward and Downward Movement.

any row being rung more than once.

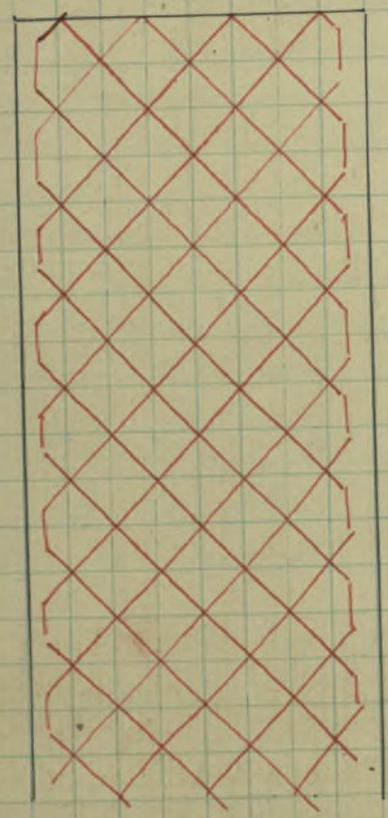
But the movement of one bell is not independent. It implies and involves the movement of other bells. In the Example given the movement of

2 3 3 into 2nds position necessitates
3 2 the movement of 2 into 3's position. If 3 is at that moment moving Backward 2 will also be moving Backward; and if 3 is moving Forward 2 will also be moving Forward.

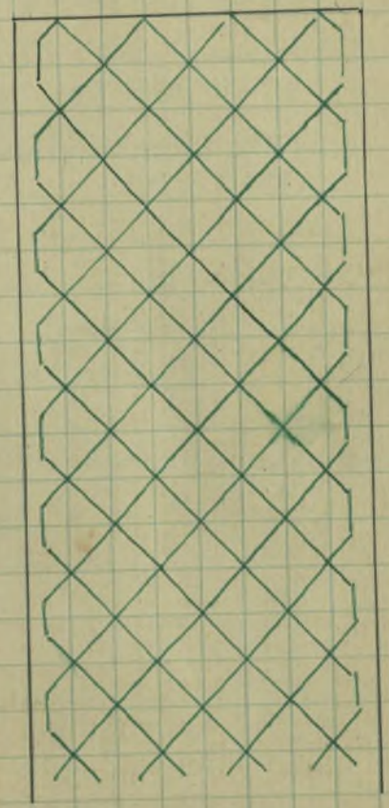
Similarly each step in the Cycle Consists of the bell changing positions with another bell, and if the Cycle is Forward the movement of the other bells will be Forward too. Or if the Cycle is backward the movement of the other bells will be backward too.

And if this movement of the other bells is continued each will complete a Cycle. and so we get the following as the simplest form of movement in Change Ringing —

A Cycle of Forwards Hunting.



A Cycle of Backward Hunting



The above is a Hunting Course and is produced when all the bells move Continuously forward, or all move Continuously backward. It is movement which starting from a given Row is always tending to bring the bells back

again to that Row.

Let 1 2 3 4 5 6 7 8 be any one Row and from it
let 2 1 4 3 6 5 8 7 be produced
by Forward Hunting of all the Bells.
Every Bell has started a movement
which tends to return the Bells
back to the row 1 2 3 4 5 6 7 8 and
will do so unless it is interrupted.
Interruption of this movement can
take place only as follows –

I In any Change Backward Movement
on all the Bells may be substituted
for the Forward Movement

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
2	4	1	6	3	8	5	7
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8

This Backward Movement tends to
return the Bells to the Row 1 2 3 4 5 6 7 8,
and will do so unless it is

interrupted.

II In any Change Backward Hunting can be substituted for the Forward Hunting of part of the bells. This introduces a Secondary Movement on the bells involved which tends to return those bells to the Row from which the movement began; and will do so unless the movement is interrupted. When the completion of the Primary Cycle Coincides with the completion of the Secondary Cycle (and not till then) the bells will return to the Row from which at first they started

III The Movement begun as Forward Hunting on all the bells may in the second Change be turned into two or more Cycles each of Forward Hunting, the bells involved in one not taking part in the other.

When the completion of one Cycle Coincides with the completion of the other and not till then the bells will return to the Row from which they first started.

1	2	3	4	5	6	7
2	1	4	3	6	5	7
2	4	1	3	6	7	5
4	2	3	1	7	6	5
4	3	2	1	7	5	6
3	4	1	2	5	7	6
3	1	4	2	5	6	7
1	3	2	4	6	5	7
1	2	3	4	6	7	5
2	1	4	3	7	6	5
2	4	1	3	7	5	6
4	2	3	1	5	7	6
4	3	2	1	5	6	7
3	4	1	2	6	5	7
3	1	4	2	6	7	5
1	3	2	4	7	6	5
1	2	3	4	7	5	6
2	1	4	3	5	7	6
2	4	1	3	5	6	7
4	2	3	1	6	5	7
4	3	2	1	6	7	5
3	4	1	2	7	6	5
3	1	4	2	7	5	6
1	3	2	4	5	7	6
1	2	3	4	5	6	7

1	2	3	4	5	6	7	8	9	0	E
2	1	4	3	6	5	8	7	0	9	E
2	1	4	6	3	8	5	7	0	E	9
1	2	6	4	8	3	7	5	E	0	9
1	2	6	8	4	7	3	5	E	9	0
2	1	8	6	7	4	5	3	9	E	0
2	1	8	7	6	5	4	3	9	0	E
1	2	7	8	5	6	3	4	0	9	E
1	2	7	5	8	3	6	4	0	E	9
2	1	5	7	3	8	4	6	E	0	9
2	1	5	3	7	4	8	6	E	9	0
1	2	3	5	4	7	6	8	9	E	0
1	2	3	4	5	6	7	8	9	0	E
2	1	4	3	6	5	8	7	0	9	E
2	1	4	6	3	8	5	7	0	E	9
1	2	6	4	8	3	7	5	E	0	9
1	2	6	8	4	7	3	5	E	9	0
2	1	8	6	7	4	5	3	9	E	9
2	1	8	7	6	5	4	3	9	0	E

Etc.

When movement is introduced among bells, that movement always tends to return the bells to the Row from which they started; and it can only be interrupted by movement which also tends to return the bells to the starting row. In this case the movement can only be interrupted by movement which equally tends to return the bells to the starting Row. And so on.

Thus the whole of Change Ringing consists of the bells doing a number of movements in the form either of completed cycles or forward and backward along the arcs of cycles. In some of these cycles all the bells are involved in some only a part of the bells. Every cycle involves at least five bells.

Our task is now to investigate the way these cycles can be put together so as to form the finished Methods and Peals.

But first it will be well to say something about Symmetry and Form.

Note:-

In the foregoing I have spoken of a Bell starting from and returning to the same position and of the Bells starting from and returning to the same Row; and I deliberately chose those expressions as best conveying my meaning. But it must be understood that any idea of the bells starting or finishing is subjective and not objective. A Round Block is movement in cyclical form and being independent of all considerations of time and space has, essentially, neither start nor finish but like a circle is perpetual. A starting point or a starting row is really the point or the row which we select in our own minds as that from which we trace the movement; and this may be any point or any row we please.

See also Article on Symmetry (J.A.T) in
Bell News. Dec 18 1915. Also Article
on "The Law of Truth" Ibid. Aug 28 1915 et seq.

* Read "submitting" submitting

Chapter IV

Symmetry.

There are many rules in Change Ringing, some of them so stringent that not the slightest breach is tolerated. And there are many standards by which men judge methods and peals, whether they be good bad or indifferent.

When we consider the history of the art, we find that these rules and standards have been, and are, at all times and in all places practically the same. Development has of course taken place, and has had its effect on them, but the rules and standards of any one period are not different from those of the preceding generation, but the same modified by the continual progress that is going on.

Now when we find a large number of men, scattered over a wide area, and belonging to different periods of time, unanimously and unquestioningly agreeing* to be bound by any rules, we must

come to the conclusion that one of two things must have happened. Either that there was some central authority with power to decree laws, and sanctions sufficient to enforce them. Or else that the rules were so inevitably connected with the matter to which they relate, that they arose spontaneously and carried their own sanctions with them. Rules which are essentially arbitrary can be enforced if there is sufficient power to do so. Rules which are based on mere fancies or fashions will endure as long as the fashions last, and will pass away with them.

Sports like football and cricket have many rules, the majority of which are arbitrary. In each case there is a central recognised authority, which has the power to make these rules and the power to alter them; power which is continually being exercised. Moreover, and particularly in the case of the Football Association, they have power to see that they are enforced, breaches being punished with

* If anyone thinks that the Method Report was an attempt to enforce new rules may I say (and no one knows better about the matter than I) that it was an attempt more or less successful to reduce to order rules which were already in operation.

heavy penalties.

In Change Ringing there is no such central authority. The Central Council has disclaimed any idea of being a legislative body. It has never attempted to introduce new rules into practical ringing*; all it has done is to some extent to define and codify rules already in operation. And in any case it is a modern body while the rules and standards have been observed for a couple of centuries.

It follows that the rules and standards which ringers observe must arise from the essential nature of ringing itself; and this is particularly true of those which can be grouped together under the general name of Symmetry.

From the very beginning ringers felt that the movement which is ringing, must not be promiscuous, but must have proper form; and from this idea, developed, we get the division of changes into Leads, Courses, and Peals.

We have seen that any block of

rows must inevitably be produced by Combinations of different cycles or Round Blocks". And we shall develope the idea and show the Laws which govern these Combinations, irrespective of whether these blocks are arranged or not in any symmetrical order. It will however very much simplify our task if we confine ourselves at first to the traditional forms of ringing and afterwards show that the same Laws are operative in all possible blocks of rows.

Symmetry is a quality inherent in nature and may be defined as the relationship of two things to each other when one is balanced by, and complementary to the other.

Now the root thing in Change Ringing is the Change which is made by "two Bells removing into each others places" * 12.
21 and in the Change you have a good an example of symmetry as you will find anywhere. The movement of 1 into 2nds place is exactly balanced by

* Tintinnalogia page 3.

and complementary to the movement of 2 into 1st place. Not only so, but one movement is dependent on and cannot take place without the other movement. Again when when we have the Hunting Course or more than two bells we have perfect symmetry.

Symmetry thus being inherent in the very fundamentals of ringing, it would be strange indeed if it were not operative in the more highly developed forms.

Now all blocks of Changes must be produced by cyclical movements. These cyclical movements are either Hunting Courses or of the nature of Hunting Courses and therefore each movement is strictly symmetrical. It is only when you get Combinations of cyclical movement that a greater or less degree of symmetry is possible in their arrangement. A promiscuous touch of Stedman will consist of a number of Changes on five bells and each of these Changes is perfectly symmetrical. It is in the arrangement

of the changes alone that more or less symmetry can be shown.

The earliest form of ringing took the shape of Hunts and Extents Bells and the Ancients found it necessary to arrange these Hunts in Symmetrical form. The division was not at first into Leads and Courses, but into the cycles which the Whole Hunt, Half Hunts and Quarter Hunts performed.*

A Peal was one Round Block; there was as yet no Method with Plain Leads and Bobs. The Conductor was in supreme Command, no bell moved from any position but at his direction. When Cross Peals were introduced each ringer had a work which he had to do and the Conductor's task was restricted to telling him what variations he had to make in his work. At first the ringers work was merely to hunt his bell, the Conductor telling him when to dodge, all variation from plain hunting being called Bobs.** Then as more complex work was introduced the ringer was expected to do some dodging and

* The Lead of Course always depends on the cycle made by the "Whole Hunt"

Not quite historically Correct

** Tintinnalogia Page 72.

place making without being warned, the Conductor only giving notice of any alteration. Thus we get the modern form of plain Courses and Bobs.

If a man is expected to do a work without being prompted, it is almost necessary that that work should be as regular as possible, and to this the inherent symmetry in ringing naturally lent itself. In addition to this the old Composers had the task before them of producing all the possible number of rows on the bells (usually five or six) and they found that this can best be done by symmetrical arrangements of the Changes.

It followed that it was accepted as a rule that the Plain Course of any Method must consist of as many Leads as there are Working Bells each Lead to be exactly alike. Or in the case of Methods like Stedman, where "every bell hath a Course alike" of as many Divisions as there are bells each Division Exactly alike.

This rule is in operation to the

* Method Repair "Rules and Decisions" of the Central Council page 17.

present day and probably will always be in force. There does not however seem any real reason why future development should not introduce methods with dissimilar leads. Nor would such development, necessarily be contrary to the spirit of the above rule. For, it must be remembered that the rule was not introduced to restrict ringing, but it grew up because men recognised that by its help they could best get ringing. And this is really the only test by which you can judge any rule, whether it is already in operation, or whether you think it should be made. Does it help you to get the best out of ringing or does it restrict you? And there is no rule in ringing that may not freely be broken if the result justifies it. But you will find that, since the accepted rules are spontaneous and not arbitrary, the instances where you may break them and do good are very, very,

few indeed.

Symmetry is an inherent quality in Change Ringing and must be taken into account. It is not as has been said merely "looking pretty on paper" You cannot have any Block of Rows without symmetry, but it is obvious that there are degrees of symmetry and the Exercise has adopted an increasingly high standard in the matter. Of late years the word has been taken to apply solely to the arrangement of the work in any one Lead or Division of a Method. A Method is said to be symmetrical or not according to whether its Lead or Division is balanced about a certain axis. Now whether we hold or not that this particular form of symmetry is essential to a Method for ringing purposes, we must admit that this is a standard and not, like symmetry in general, a fundamental quality. We can argue, and I think argue correctly, that it is a stage of development which Ringing has reached and to abandon it is to go backwards. We can shew its value in getting true

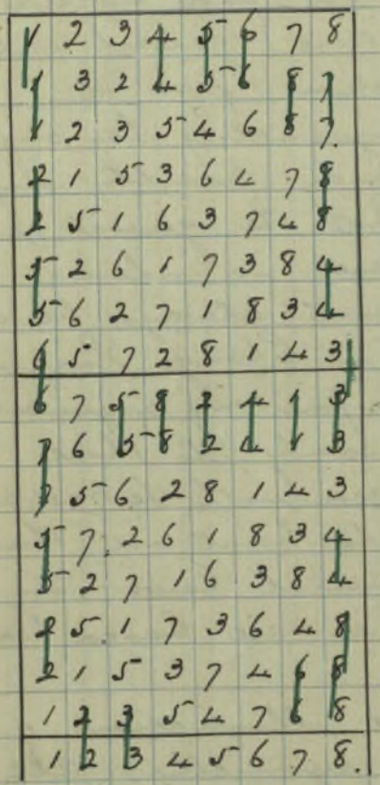
* See Article (JAT) Bell News. Aug 18 1915

peals.* But we may not say that Methods cannot exist without it. We may not treat it as an essential quality of a Method, and proceed to draw (as has been done) general rules of Method Construction from it. The standard of symmetry has shifted in the past, and may possibly shift in the future. But the general quality on which it is based is inherent and symmetry must always be a dominant factor in Change Ringing.

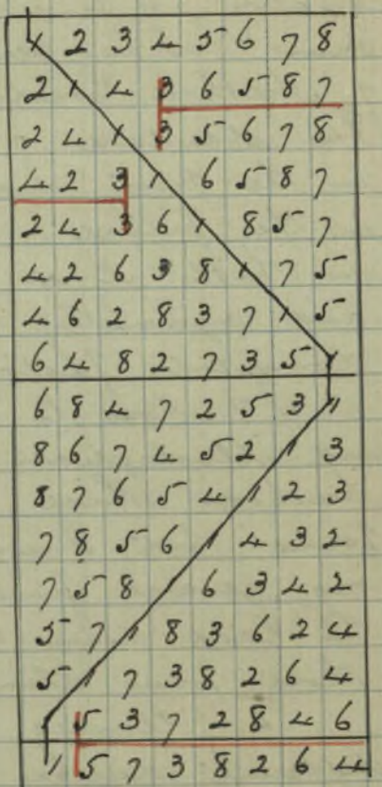
I propose to confine my arguments and illustrations mainly to those Methods which agree with the traditional forms; but I must to point out that no general fundamental laws may be laid down which are based on those forms alone.

The following are illustrations of different degrees of symmetry. All these blocks show symmetry to some extent; but B is more symmetrical than A. C than B. and D than C. At early times the standard of symmetry required was between A and B. In the course of time it has been raised

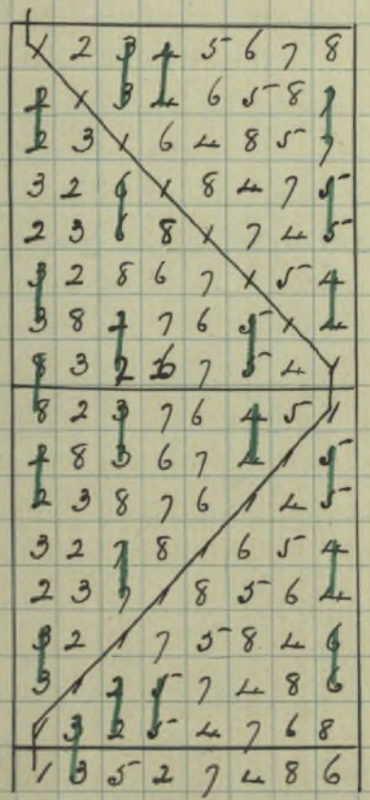
A.



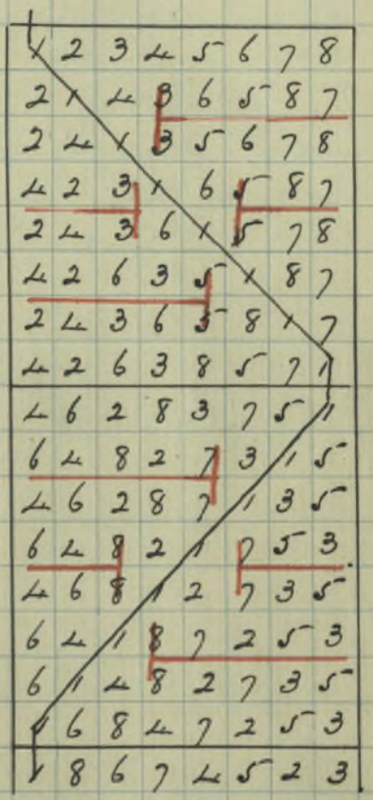
B. YORKSHIRE COURT. MAJ.



C. LOUGHBOROUGH B. MAJ.



D. D. NORWICH CB. MAJ.



* J. W. Washbrooks Method CAVERSHAM. is not symmetrical according to this standard.

to between B and C and though there are able people* who do not accept that standard the general experience of the Exercise has decided that is the best place. But note that there is no essential necessity for fixing it there; the general experience of the Exercise could have raised it still higher and fixed it between C and D. However it has not done so.

Chapter V

The Principle & Coursing Order.

If from any given Row all the bells move forward,
and if that movement is continued,
then a Forward Hunting Course is produced.

Similarly; if from any given Row all the bells move backward,
and if that movement is continued,
then a Backward Hunting Course is produced.

A. FORWARD HUNTING C.

1	2	3	4
2	1	4	3
2	4	1	3
4	2	3	1
4	3	2	1
3	4	1	2
3	1	4	2
1	3	2	4
1	2	3	4

B. BACKWARD H.C.

1	2	3	4
1	3	2	4
3	1	4	2
3	4	1	2
4	3	2	1
4	2	3	1
2	4	1	3
2	1	4	3
1	2	3	4

product (ESP)

These are exactly the same thing except that one is the opposite of the other in the direction of the movement and the order in which the Rows turn up. Since 1234 may represent any Row, either Block may be considered as Forward or as Backward; but if once A is considered as Forward then B. must be considered as Backward; and vice versa.

With x bells the total number of Rows = P. P being the result of the well known mathematical product. $1 \times 2 \times 3 \times 4 \times 5 \ldots$

These P Rows will divide into $\frac{P}{2x}$ Hunting Courses, which are mutually exclusive.

Each of these $\frac{P}{2x}$ Hunting Courses can be produced either by Forward or by Backward Hunting.

The P Rows cannot be divided into any other groups of Blocks which—

a. are mutually exclusive;

b. do not contain repetition of Rows.

By mutually exclusive I do not mean that you cannot divide the P rows into other groups of Blocks which

are equal to each other and which together contain the total number of Rows,

But that you cannot have two Hunting Courses which contain the same Row unless every Row is the same. And Conversely if one Hunting Course has a Row different from any Row in another Hunting Course then all the Rows must be dissimilar.

The Hunting Course thus being

a. The result of the most simple form of movement; and

b. The only exclusive Block possible,

naturally becomes the unit of Construction and Composition.

It is to some extent analogous to the atom in Chemistry.

In any Hunting Course the cyclical paths of the Bells follow each other in a definite regular order.

This order is Causing Order and it is Cyclical in form.

It is advisable always to write down Causing Order Cyclically.

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
8	7	6	5	4	3	2	1
7	8	5	6	3	4	1	2
7	5	8	3	6	1	4	2
5	7	3	8	1	6	2	4
5	3	7	1	8	2	6	4
3	5	1	7	2	8	4	6
3	1	5	2	7	4	8	6
1	3	2	5	4	7	6	8
1	2	3	4	5	6	7	8

C.O. =

4 6
2 8
1 7
3 5

6	2	8	7	5	3	1	4
6	8	2	5	7	1	3	4
8	6	5	2	1	7	4	3
8	5	6	1	2	4	7	3
5	8	1	6	4	2	3	7
5	1	8	4	6	3	2	7
1	5	4	8	3	6	7	2
1	4	5	3	8	7	6	2
4	1	3	5	7	8	2	6
4	3	1	7	5	2	8	6
3	4	7	1	2	5	6	8
3	7	4	2	1	6	5	8
7	3	2	4	6	1	8	5
7	2	3	6	4	8	1	5
2	7	6	3	8	4	5	1
2	6	7	8	3	5	4	1
6	2	8	7	5	3	1	4

C.O. =

8 5
6 1
2 4
7 3

In practical singing the term Causing Order is used in a rather wider and looser sense. In the science

of ringing it belongs exclusively to the Hunting Course.

Each Hunting Course has its own Causing Order and therefore the C.O. may stand as the signature of the Hunting Course. If at any two Changes the bells are in the same C.O. that is a sign that those two Changes belong to the same Hunting Course.

Causing Order belonging exclusively to the Hunting Course it is obvious that there can be no common C.O. in any Change where part of the bells are hunting forward and part are hunting backward

1 2 3 4 5 6 7 8	← No common C.O.
2 1 3 5 4 7 6 8	← C.O. = 21578643
1 2 5 3 7 4 8 6	← No common C.O.
2 1 5 7 3 8 4 6	← do do.
2 5 1 7 8 3 6 4	← CO. 25734681.
5 2 7 1 3 8 4 6	

But here is a C.O. among those bells which are hunting forward, and among those bells which are hunting

backwards.

All that has been said about Hunting Courses which are made by all the bells applies with equal force to Hunting Courses which are made by a part of the bells only; and equally whether as in Ex A the whole Hunting Course is made together, or whether part is made in one Lead and part in another.

It will be noticed that in any Hunting Course either on all the bells or on part either made straight off or at different times the Rows come in a definite order either forward or backward. No other order is possible

A

x	2	3	4	5	6	7	8
2	x	4	3	5	7	6	8
x	2	3	4	7	5	8	6
2	x	4	3	7	8	5	6
2	4	x	3	8	7	6	5
4	2	3	x	8	6	7	5
2	4	x	3	6	8	5	7
4	2	3	x	6	5	8	7
2	4	3	6	x	5	7	8
4	2	6	3	5	x	8	7

C.O. of Hunting Course on 5678 =

$$\begin{matrix} & 7 & \\ 5 & & 8 \\ & 6 & \end{matrix}$$

In a Dodging Movement (page 45) the bells

having done some part of a Hunting Course retrace their steps back to the row from which they started.

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
2	4	1	6	3	8	5	7
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8

This will reproduce the same Rows which have already appeared.

As the bells are all moving forward at the same time, or backward at the same time, they keep the same Causing Order.

Similarly any Block formed by mixed Hunting Courses and Dodging Movements when all the bells are moving forward at the same time or backward at the same time will Consist of the Rows of the Hunting Course with varying repetitions, and no other Rows. And the bells will be in the same Causing Order throughout.

These Blocks are the Principles on which Methods are built.

Their claim to be the scientific foundations of all Methods depends

entirely on the fact that they alone have the same Coursing Order throughout.

Theoretically it is not necessary for a Principle to be symmetrical; but the standard of symmetry adopted by the Exercise has for practical purposes confined the Principles in use to two — the Plain Principle and the Treble Bob Principle; though the Double Dodging and Triple Dodging Principles are occasionally used.

PLAIN PRINCIPLE

1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	6	1	5	3
4	6	2	5	1	3
6	4	5	2	3	1
6	5	4	3	2	1
5	6	3	4	1	2
5	3	6	1	4	2
3	5	1	6	2	4
3	1	5	2	6	4
1	3	2	5	4	6

TREBLE BOB PRINCIPLE

1	2	3	4	5	6
2	1	4	3	6	5
1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	6	1	5	3
2	4	1	6	3	5
4	2	6	1	5	3
4	6	2	5	1	3
6	4	5	2	3	1
4	6	2	5	1	3

Etc.

DOUBLE DODGING P.

1	2	3	4	5	6
2	1	4	3	6	5
1	2	3	4	5	6
2	1	4	3	6	5
1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	6	1	5	3
2	4	1	6	3	5
4	2	6	1	5	3
2	4	1	6	3	5
4	2	6	1	5	3
4	6	2	5	1	3
6	4	5	2	3	1
4	6	2	5	1	3
6	4	5	2	3	1
4	6	2	5	1	3
6	4	5	2	3	1
6	5	4	3	2	1
5	6	3	4	1	2
6	5	4	3	2	1
5	6	3	4	1	2
6	5	4	3	2	1
5	6	3	4	1	2
5	3	6	1	4	2

TRIPLE DODGING P.

1	2	3	4	5	6
2	1	4	3	6	5
1	2	3	4	5	6
2	1	4	3	6	5
1	2	3	4	5	6
2	1	4	3	6	5
1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	6	1	5	3
2	4	1	6	3	5
4	2	6	1	5	3
2	4	1	6	3	5
4	2	6	1	5	3
4	6	2	5	1	3
6	4	5	2	3	1
4	6	2	5	1	3
6	4	5	2	3	1
4	6	2	5	1	3
6	4	5	2	3	1
6	5	4	3	2	1.

ALLIANCE PRINCIPLE.

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
1	3	2	5	4	7	6	8
3	1	5	2	7	4	8	6
1	3	2	5	4	7	6	8
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
2	4	1	6	3	8	5	7
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
4	6	2	8	1	7	3	5
4	2	6	1	8	3	7	5
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
8	8	4	7	2	5	1	3

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
8	7	6	5	4	3	2	1
7	8	5	6	3	4	1	2
8	7	6	5	4	3	2	1
7	8	5	6	3	4	1	2
7	5	8	3	6	1	4	2
5	7	3	8	1	6	2	4
5	3	7	1	8	2	6	4
3	5	1	7	2	8	4	6
3	1	5	2	7	4	8	6
1	3	2	5	4	7	6	8
3	1	5	2	7	4	8	6
1	3	2	5	4	7	6	8
1	2	3	4	5	6	7	8

All the Principles given as examples consist of a single Hunting Course with a number of Dodging Movements, similar to each other, inserted at intervals so as to produce a symmetrical Round Block.

The explanation of Method Construction I propose to give is this. That just as a Composer takes the Plain Course of a Method and from it by means of Bobs & Singles constructs touches and peals: So you can take a Principle and from it by means of Plunts, construct Methods.

And that just as Bobs cannot be put haphazardly into a Peal, but must obey certain natural Laws, such as the Law of the Extents: So and equally, Plunts must obey certain, natural Laws.

It has been objected that the Treble Bob Principle is impossible and does not exist. I do not understand the objection. Surely it cannot be denied that you can have a Round Block in which every bell does a

Treble Bob Hunting path. Certainly there are repetitions of Rows but what is that to the point? A Principle is not a thing that you ring, but the foundation of Methods. You cannot get such Courses of Bredman, Triples without repetition of rows. nor twenty three Courses of Cambridge Major without falseness. yet these Courses can be used to produce true peals.

My present definition differs somewhat from that of the Method Report. In that Report a Principle is defined as a collection of rows which form a perfect round block in which, -

(a) each bell does the same work;

(b) no bell moves up or down more than one place at a time;

(c) no bell lies more than two Consecutive blows in any one place.

(c) is wrong. It is a bad case of mixing up standards of good Methods with fundamental rules.

(a) is essential only if your finished Method is to conform to some standard.

(b) of course is implied in the nature of any Round Block.

At the time of the Method Report the Committee was of the opinion that any symmetrical Round Block which obeyed these rules was a Principle, and could be used as the base of Methods. As the result of further investigations I am of the opinion that the term can only be applied to Blocks in which the C.O. is the same throughout, and that rules (a) and (c) do not apply.

But though the Method Report definition is faulty, the general idea on which it was founded is sound, and was a great step forward in the then knowledge of Methods.

Chapter VI

Methods "in which every Bell hath a Course alike."

All Methods which are constructed in the traditional forms of ringing fall into two groups:—

I Methods in which every bell hath a course alike.
II Methods which have a Hunt or Hunts and Exclusive (or Working) Bells.

We used to call the first group,
Principles used as Methods;
and the second group,
Methods founded on Principles;
but the altered definition of a Principle makes these terms no longer applicable.

The Glossary calls the first group the Stedman Group after the best known Method in it, and this is not a bad name for it.

At other times these Groups have

been called Treble Domenaled and now Treble Dominaled; which are clumsy names, and may suggest an untruth. The name I have given to Group I is the description Stedman gave to his Method and does fairly distinguish it from other Methods. Its chief defect is in the obsolete meaning of the word Course, which must be taken as equal to "Work" or "movement"

Group I Methods subdivide as follows:-

A Original.

B. Methods in which the Division Heads and Ends are those of the Principle on which it is founded; and which have Shuntis made in the interior of the Divisions.

C. Methods in which Shuntis begun in one Division are completed in another; or in some cases are spread over three or more Divisions

A. Original This is the Humbing Course used as the Course of a Method. It is interesting to notice that this Block

has different uses and different names at different stages in the science of ringing. First it is the Hunting Course, the most elementary form of movement possible. Then it is the Plain Principle, the foundation on which a large proportion of Methods ~~are~~ is built. Lastly it is Original a complete Method in itself.

In its construction it shows most of the qualities of Methods. It consists of a single cyclical movement; all Methods consist of cyclical movements. It divides into a number of Divisions, the number of Divisions being equal to the number of bells making the movement. This quality is common to all Methods, though in some cases it is not so obvious as in others. The Division Heads and Ends are the Rows of the Hunting Course; these are the Natural Division Heads and Ends of all Methods. It is symmetrical; and this symmetry is reproduced to a greater or less degree in all Methods. It is an excellent Method to study both from the point of Construction

and Peal Composition. One or two Peals of it have been rung, but owing to the sameness of its work it is not likely to be ever a popular method.

B.

(a)

1	2	3	4	5	6
2	1	4	3	6	5
1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	6	1	5	3
2	4	1	6	3	5
4	2	6	1	5	3
4	6	2	5	1	3
6	4	5	2	3	1
4	6	2	5	1	3
6	4	5	2	3	1
6	5	4	3	2	1
5	6	3	4	1	2
6	5	4	3	2	1
5	6	3	4	1	2
5	3	6	1	4	2
3	5	1	6	2	4
5	3	6	1	4	2
3	5	1	6	2	4
3	1	5	2	6	4
1	3	2	5	4	6
3	1	5	2	6	4
1	3	2	5	4	6
1	2	3	4	5	6

(a) is the Treble Bob Principle on six bells. It consists of six equal Divisions, and all the bells work alike. It is symmetrical in form. Therefore it would be very suitable for the Course of a Method but, for the fact that it contains repetition of rows. To make it suitable we must alter some of the Rows so as to get rid of this

repetition. All the Methods in the Subdivision B. we are now considering have as their Division Heads and Ends the Rows of the Hunting Course. These are the Division Heads and Ends of the Principle and they must remain unaltered. The alteration must be in the Rows in the interior of the Division. The Division Heads and Ends include all the Rows in the same Coursing Order, therefore the alteration must be by introducing fresh C.P. Each Division of any Method in this Group is exactly alike in its work. Therefore it will be sufficient to take one Division and see what can be done with it, the other Divisions following automatically

a	1 2 3 4 5 6	x
c	2 1 4 3 6 5	1.
d	1 2 3 4 5 6	3.
b.	2 1 4 3 6 5	

Rows a. and b may not be allied. Rows c and d. must be allied.

In the Change x the bells are making a forward movement. This movement we must interrupt in order to produce a Row different from c. As we saw on page 29 we have three alternatives.

First we can substitute backward movement of all the bells for the forward movement of all the bells. This would give us -

$$\begin{vmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 1 & 3 & 2 & 5 & 4 & 6 \end{vmatrix} x$$

But backward movement on all the bells, equally with forward movement on all the bells, retains the same C.O. and produces the Row 132546. Which is already marked out as a Division End in the Method.

Second. We can turn the movement on all the bells, into two separate and independent Cyclical movements, one on part of the bells, and the other on the rest. This is forbidden by the condition of this Group of Methods. That every bell hath a Course alike.

Thirdly, we can substitute backward Dumbling for the forward dumbling of some of the bells.

Thus 3 and 4 by forward dumbling change positions. If all the bells

were backward hunting 3 would go into 2nds position and 4 into 5th. But if these two bells are backward hunting among themselves only, the result is as follows. 34
34

This will be readily understood if we see what would happen if the bells were 3564. Then the first change of backward hunting would be.—

3564
3654

34 have now begun a cyclical movement among themselves which tends to return them to their original positions. Continue the movement and we get—

p. 43.
34 Notice that the cycle
34 is completed from the
43 point p., half way
m 43. between 43 and 34,
34. and the point m,
half way between 43
and 34. The last 34 need not
come up to complete the cycle.
Meanwhile the other bells have been
doing the combined forward and

backward movement of the Treble Bob Principle. and the completion of the Hunting Course on 3-4 coincides with that movement. The bells drop again into the same Causing Order and are in a position to continue the Cyclical movement of the Treble Bob Principle. But unless the Hunting Course on 3-4 is completed the Causing order is not regained, and the bells will not come round at the Course End.

1	2	3	4	5	6
2	1	3	4	6	5
1	2	4	3	5	6
2	1	4	3	6	5
2	4	1	6	3	5

We have therefore a primary cycle, that of the Principle, consisting of mixed forward and backward Hunting; and a Secondary Cycle, on the bells 3-4, consisting of a Backward Hunting Course.

Secondary Cycles like the above I call Shunts. And by a Shunt is to be understood not merely a breakage of Causing Order but the whole movement which breaks and regains the Causing Order. When I first, some years ago.

introduced the term, I applied it to any interruption of Causing Order. I called this such interruptions made in conjunction a Compound Shunt and the whole operation of breaking and regaining Causing order a Compound Resolved Shunt. But in Method Construction the breakage of Causing Order without the means by which it is regained is meaningless. If you break C.O. it is implied (by the nature of a Round Block) that you regain it. And I now apply the term Shunt to the whole operation. Some people, however, who have copied my use of the word use it still in my first meaning.

Since all the Divisions in the Method belonging to the Group we are considering are alike, it remains only to introduce into every Division a Shunt similar to the one we introduced into the first Division, and you have a Plain Course of the Method.

By a Plain Course is meant any complete Course starting from any Row,

* The Courses of Granda Treble Bob are not Plain Courses although there are no formal Bobs. The whole Method consisting of mixed Oxford and Kent.

which Course is produced without Bobs, Singles, or any special Call.*

The Course beginning or ending with Rounds — 1 2 3 4 5 6 . . . — is usually called the Plain Course. Rightly so in practical ringing, where Changes always begin with Rounds. In theoretic ringing this Course is nowise different from any other Course, except so far as every individual Course is composed of individual Rows. But following Convention I usually chose it for illustration.

The Method we have constructed — Forward Minor — Consists of,

first the Treble Bob Principle, which has six equal Divisions, as many as there are bells.

and secondly of a Shunt in each Division consisting of a Backward Hunting Course for the two bells in 3-4.

The only feature which quite unfits the Course and which settles the length of the Course is the Principle. The Shunts are independent of each.

T.B. PRINCIPLE

1	2	3	4	5	6
2	1	4	3	6	5
1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	6	1	5	3
2	4	1	6	3	5
4	2	6	1	5	3
4	6	2	5	1	3
6	4	5	2	3	1
4	6	2	5	1	3
6	4	5	2	3	1
6	5	4	3	2	1
5	6	3	4	1	2
6	5	4	3	2	1
5	6	3	4	1	2
5	3	6	1	4	2
3	5	1	6	2	4
5	3	6	1	4	2
3	5	1	6	2	4
3	1	5	2	6	4
1	3	2	5	4	6
3	1	5	2	6	4
1	3	2	5	4	6
1	2	3	4	5	6

1	2	3	4	5	6
2	1	3	4	6	5
1	2	4	3	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	6	1	5	3
2	4	1	6	3	5
4	2	6	1	5	3
4	6	2	5	1	3
6	4	5	2	3	1
4	6	2	5	1	3
6	4	5	2	3	1
6	5	4	3	2	1
5	6	3	4	1	2
6	5	4	3	2	1
5	6	3	4	1	2
5	3	6	1	4	2
3	5	6	1	2	4
5	3	1	6	4	2
3	5	1	6	2	4
3	1	5	2	6	4
1	3	5	2	4	6
3	1	2	5	6	4
1	3	2	5	4	6
1	2	3	4	5	6

FORWARD MINOR.

1	2	3	4	5	6
2	1	3	4	6	5
1	2	4	3	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	1	6	5	3
2	4	6	1	3	5
4	2	6	1	5	3
4	6	2	5	1	3
6	4	2	5	3	1
4	6	5	2	1	3
6	4	5	2	3	1
6	5	4	3	2	1
5	6	4	3	1	2
6	5	3	4	2	1
5	6	3	4	1	2
5	3	6	1	4	2
3	5	6	1	2	4
5	3	1	6	4	2
3	5	1	6	2	4
3	1	5	2	6	4
1	3	5	2	4	6
3	1	2	5	6	4
1	3	2	5	4	6
1	2	3	4	5	6

other. Any one could be ~~altered~~ omitted without affecting the rest or altering the Course, except so far as the particular two bells are immediately Concerned. This is shewn by Example on page 88.

Forward Minor is an exact illustration of the Construction of every Method in Group I Subdivision B.

First you have the Principle.

Then you have one or more Shunts in each Division.

These Shunts must always Consist of Complete Movements - either Hunting Courses or Dodging Movements.

The simplest are a Class of Methods in which the Principle is Treble Bob Hunting, Double Dodging Hunting, Triple Dodging Hunting &c.
And the Shunt Consists of a Plain Hunting Course, the Length of which exactly Coincides with the number of Changes in a Division of the Principle.

These Hunting Courses will be reverse movements to the main movement of the

Principle. The following are Examples.

THE PRINCIPLE

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

FORWARD MAJOR

1	2	3	4	5	6	7	8
2	1	3	4	6	5	8	7
1	2	4	3	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
2	1	4	3	5	6	8	7
1	2	3	4	6	5	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

BARNSBURY MAJOR.

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
2	1	3	5	4	6	8	7
1	2	5	3	6	4	7	8
2	1	5	6	3	4	8	7
1	2	6	5	4	3	7	8
2	1	6	4	5	3	8	7
1	2	4	6	3	5	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

THE PRINCIPLE

1	2	3	4	5	6	7
1	3	2	5	4	7	6
1	2	3	4	5	6	7
1	3	2	5	4	7	6
1	2	3	4	5	6	7
1	3	2	5	4	7	6
3	1	5	2	7	4	6

REVERSE ERIN TRIP.

1	2	3	4	5	6	7
2	1	3	5	4	7	6
2	3	1	4	5	6	7
3	2	1	5	4	7	6
3	1	2	4	5	6	7
1	3	2	5	4	7	6
3	1	5	2	7	4	6

1	2	3	4	5	6	7
2	1	4	3	6	5	7
2	4	1	6	3	7	5
2	1	4	3	6	5	7
2	4	1	6	3	7	5
2	1	4	3	6	5	7
2	4	1	6	3	7	5
4	2	6	1	7	3	5

ERIN TRIP.

1	2	3	4	5	6	7
2	1	4	3	6	5	7
1	2	4	6	3	7	5
1	4	2	3	6	5	7
4	1	2	6	3	7	5
4	2	1	3	6	5	7
2	4	1	6	3	7	5
4	2	6	1	7	3	5

1	2	3	4	5	6	7
2	1	4	3	6	5	7
1	2	3	4	5	6	7
2	1	4	3	6	5	7
1	2	3	4	5	6	7
2	1	4	3	6	5	7
2	4	1	6	3	7	5

REVERSE ERIN TRIPLES

1	2	3	4	5	6	7
2	1	4	3	5	7	6
1	2	3	4	7	5	6
2	1	4	3	7	6	5
1	2	3	4	6	7	5
2	1	4	3	6	5	7
2	4	1	6	3	7	5

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	3	6	8	5	7
2	1	4	6	3	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
1	2	3	4	5	6	7	8
1	2	4	3	6	5	8	7
2	1	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7

1	2	3	4	5	6	7	8
2	1	3	5	4	7	6	8
1	2	5	3	7	4	8	6
2	1	5	7	3	8	4	6
1	2	7	5	8	3	6	4
2	1	7	8	5	6	3	4
1	2	8	7	6	5	4	3
2	1	8	6	7	4	5	3
1	2	6	8	4	7	3	5
2	1	6	4	8	3	7	5
1	2	4	6	3	8	5	7
2	1	4	3	6	5	8	7

The foregoing class of Methods we will call the FORWARD CLASS.

When the Principle is the Double Dodging, 4-pull Dodging, 6-pull Dodging, and so on in a regular progression (2-4-6-8-10-12 etc) the Shunts will be made by an odd number of bells, and must be immediately next Before or Behind.

When the Principle is the Treble Bob, 3 pull Dodging, 5-pull dodging and so on in a regular progression (1-3-5-7-9-11 etc) the Shunts will be made by an even number of bells; and may be either at Behind or Before or in the interior. When the Shunts is made at Behind or Before certain bells will lie or lead four (three) Consecutive blows.

The next Class of Methods Consists of those in which two or more similar Shunts are made in the same Division

The following Examples will be sufficient Explanation:—

THE PRINCIPLE.

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
2	1	3	4	5	6	8	7
1	2	4	3	6	5	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
1	2	4	3	5	6	8	7
2	1	3	4	6	5	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	4	6	3	5	7	8
1	4	2	3	6	7	5	8
4	1	2	6	3	7	8	5
4	2	2	3	6	8	7	5
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5

Two similar Shunts cannot be made in the same Division of any Principle on an odd number of Bells.

When the Principle is the Double Dodging or in the following progression (2-4-6-8-10--Full dodging) and when the dodging is in 2-3, 4-5, 6-7 etc; the Shunts will be Hunting Courses on an odd number of Bells and must be made immediately next Before and Behind, never in the interior of the Division.

When the Principle is 2-4-6-8-- Full dodging, and the dodging is in 1-2, 3-4, 5-6 etc. these Shunts cannot be made.

When the Principle is Treble Bob or in the following progression (1-3-5-7-9---Full dodging) the positions and possible numbers of Shunts are in direct ratio to the number of Bells.

Consequently a simple formula can be set down giving all possible Methods in the last five Classes (see Formula No. page.

The next Class consists of Methods that have two or more dissimilar

Sheets in each Division Examples:-

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
2	1	3	4	6	5	8	7
1	2	4	3	6	5	7	8
2	1	3	4	5	6	8	7
1	2	4	3	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
2	1	4	3	5	6	8	7
1	2	4	3	6	5	7	8
2	1	3	4	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
2	1	4	3	6	5	8	7
4	2	6	1	8	3	7	5

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	6	8	5	7
1	3	2	6	4	8	7	5
3	1	6	2	4	7	8	5
3	6	1	4	2	7	5	8
6	3	4	1	2	7	8	5
6	4	3	2	1	7	5	8
4	6	2	3	1	5	7	8
4	2	6	1	3	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5

1	2	3	4	5	6	7	8	9
2	1	4	3	6	5	8	7	9
2	4	1	6	3	8	5	9	7
2	1	4	3	6	5	8	7	9
2	4	1	6	3	8	5	9	7
2	1	4	3	6	5	8	7	9
2	4	1	6	3	8	5	9	7
2	1	4	3	6	5	8	7	9
2	4	1	6	3	8	5	9	7
2	1	4	3	6	5	8	7	9
2	4	1	6	3	8	5	9	7
4	2	6	1	8	3	9	5	7

1	2	3	4	5	6	7	8	9
2	1	4	3	6	5	8	7	9
1	2	3	4	6	8	5	9	7
1	3	2	6	4	8	9	5	7
3	1	6	2	4	9	8	7	5
3	6	1	4	2	9	7	8	5
6	3	4	1	2	7	9	5	8
6	4	3	2	1	7	5	9	8
4	6	2	3	1	5	7	8	9
4	2	6	1	3	5	8	7	9
2	4	1	6	3	8	5	9	7
4	2	6	1	8	3	9	5	7

2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
8	7	6	5	4	3	2	1
7	8	5	6	3	4	1	2
8	7	6	5	4	3	2	1
7	8	5	6	3	4	1	2
7	5	8	3	6	1	4	2
5	7	3	8	1	6	2	4
5	3	7	1	8	2	6	4
3	5	1	7	2	8	4	6
3	1	5	2	7	4	8	6
1	3	2	5	4	7	6	8
3	1	5	2	7	4	8	6
1	3	2	5	4	7	6	8
3	1	5	2	7	4	8	6

2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	3	4	6	5	8	7
1	2	4	3	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
6	8	4	7	2	5	1	3
8	6	7	4	2	5	3	1
6	8	4	7	5	2	1	3
8	6	7	4	5	2	3	1
8	7	6	5	4	3	2	1
7	8	5	6	4	3	1	2
8	7	6	5	3	4	2	1
7	8	5	6	3	4	1	2
7	5	8	3	6	1	4	2
5	7	3	8	1	6	2	4
5	3	7	1	8	2	6	4
3	5	1	7	2	8	4	6
3	1	5	2	7	4	8	6
1	3	5	2	4	7	6	8
3	1	2	5	4	7	8	6
1	3	2	5	4	7	6	8
3	1	5	2	7	4	8	6

2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	3	4	6	5	8	7
1	2	4	3	6	5	7	8
2	1	4	3	5	6	8	7
2	4	1	5	3	8	6	7
4	2	5	1	8	3	7	6
4	5	2	8	1	7	3	6
5	4	8	2	7	1	6	3
5	8	4	7	2	6	1	3
8	5	7	4	2	6	3	1
5	8	7	4	6	2	1	3
8	5	4	7	6	2	3	1
8	4	5	6	7	3	2	1
4	8	6	5	7	3	1	2
8	4	6	5	3	7	2	1
4	8	5	6	3	7	1	2
4	5	8	3	6	1	7	2
5	4	3	8	1	6	2	7
5	3	4	1	8	2	6	7
3	5	1	4	2	8	7	6
3	1	5	2	4	7	8	6
1	3	5	2	7	4	6	8
3	1	2	5	4	7	8	6
1	3	2	5	7	4	6	8
3	1	5	2	4	7	8	6

A

2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
1	3	2	5	4	7	6	8
1	2	3	4	5	6	7	8
1	3	2	5	4	7	6	8
1	2	3	4	5	6	7	8
1	3	2	5	4	7	6	8
1	2	3	4	5	6	7	8
1	3	2	5	4	7	6	8
1	2	3	4	5	6	7	8
1	3	2	5	4	7	6	8
3	1	5	2	7	4	8	6

B.

	2	1	4	3	6	5	8	7
	1	2	3	4	5	6	7	8	6'
a'	2	1	3	5	4	6	8	7	
	2	3	1	4	5	8	6	7	
	2	1	3	5	4	6	8	7	
	2	3	1	4	5	8	6	7	
	2	1	3	5	4	8	7	6	b^2
	2	3	1	4	5	7	8	6	
a²	3	2	1	5	4	8	7	6	
	3	1	2	4	5	7	8	6	b^3.
	1	3	2	5	4	7	6	8	
	3	1	5	2	7	4	8	6	

C

2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	3	5	4	6	8	7
2	3	1	5	4	8	6	7
2	1	3	4	5	6	8	7
2	3	1	5	4	8	6	7
2	1	3	4	5	8	7	6
2	3	1	5	4	7	8	6
3	2	1	4	5	8	7	6
3	1	2	4	5	7	8	6
1	3	2	5	4	7	6	8
3	1	5	2	7	4	8	6

D

2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	3	5	4	6	8	7
2	3	1	5	6	4	7	8
3	2	5	1	4	6	8	7
2	3	1	5	4	8	6	7
3	2	1	4	5	8	7	6
2	3	4	1	5	7	8	6
3	2	1	4	7	5	6	8
3	1	2	4	5	7	8	6
1	3	2	5	4	7	6	8
3	1	5	2	7	4	8	6

In all these Methods there are :—

First, the Principle. That is a cyclical movement shared equally by all the bells. This alone gives unity to the Course and settles the number of Rows in the Course, as well as the number of Divisions and the Division Heads and Ends.

Second, a number of Shunts one or more in each Division. Each Shunt is a cyclical movement on part of the bells, and consists of either a Hunting Course or of a Dodging Movement. Each Shunt is independent and complete in itself.

The Examples given on pages 90, 91, 92, 94 and 96 are easily understood. In them the Shunts are all Hunting Courses, the movement being peculiar to the movement of the Principles.

In the first Example on page 96 a each Division has five Shunts the first being a Hunting Course on five bells the other a Dodging Movement on three bells, four Changes of forward movement being followed by four Changes of backward movement.

The Principle of Example on page 97.

consisting of a Hunting Course & backward movement into each Division & which a Hunting Course & forward movement and four Dodging Movements are inserted Each Division has six Shuntis, each a Hunting Course on five bells.

The first Example on page 98 is rather more complex but the Construction is essentially the same.

The Principle is the 4-pull Dodging Principle on eight bells

Figure B is produced by five 3 bell Hunting Courses; one consisting of a' and a^2 is divided in five pieces; the other consisting of $b' b^2 b^3$ is in three pieces

Figure C is produced from Figure B by one 2 bell Hunting Course on 5-6 which is in five pieces

Figure D.

In this last Example some of the bells are not only engaged in the primary cycle of the Principle and the secondary cycle of a Stunt, but at the same time in more than one secondary cycle. The actual movement of the bell depends not on one cycle only but on the total of all the movements cycles.

All the Methods I have given as examples divide into a number of equal Divisions and each Division is symmetrical in form. This is so because first the Principles are symmetrical, and second because the arrangements of the Stunts in the Divisions are symmetrical. These Methods can form to the standard of Symmetry usually accepted by the Exercise.

But the essential feature of the Construction of these Methods do not depend on this symmetry. Each Hunting Course, and each Dodging Movement, in a Principle is in fact symmetrical; but the arrangement of these Hunting Courses

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
8	7	6	5	4	3	2	1
7	8	5	6	3	4	1	2
8	7	6	5	4	3	2	1
7	8	5	6	3	4	1	2

Continued.

1	2	3	4	5	6	7	8
2	1	3	4	6	5	8	7
1	2	4	3	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	1	3	6	8	7	5
2	4	3	1	8	6	5	7
4	2	3	8	1	6	7	5
2	4	8	3	6	1	5	7
4	2	8	6	3	1	7	5
2	4	6	8	1	3	5	7
4	2	6	1	8	3	7	5
4	6	2	8	1	7	3	5
6	4	8	2	1	7	5	3
4	6	2	8	7	1	3	5
6	4	2	8	7	1	5	3
4	6	8	2	1	7	3	5
6	4	8	2	7	1	5	3
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
8	7	6	5	4	3	2	1
7	8	5	6	4	3	1	2
8	7	6	5	3	4	2	1
7	8	5	6	3	4	1	2

Continued.

7	5	8	3	6	1	4	2
5	7	3	8	1	6	2	4
7	5	8	3	6	1	4	2
5	7	3	8	1	6	2	4
7	5	8	3	6	1	4	2
5	7	3	8	1	6	2	4
7	5	8	3	6	1	4	2
5	7	3	8	1	6	2	4
5	3	7	1	8	2	6	4
3	5	1	7	2	8	4	6
5	3	7	1	8	2	6	4
3	5	1	7	2	8	4	6
5	3	7	1	8	2	6	4
3	5	1	7	2	8	4	6
5	3	7	1	8	2	6	4
3	5	1	7	2	8	4	6
3	1	5	2	7	4	8	6
1	3	2	5	4	7	6	8
3	1	5	2	7	4	8	6
1	3	2	5	4	7	6	8
1	2	3	4	5	6	7	8

7	5	8	3	6	1	4	2
5	7	8	3	1	6	2	4
7	5	3	8	6	1	4	2
5	7	8	3	6	1	2	4
7	5	3	8	1	6	4	2
5	7	3	8	6	1	2	4
7	5	8	3	1	6	4	2
5	7	3	8	1	6	2	4
5	3	7	1	8	2	6	4
3	5	1	7	8	2	4	6
5	3	7	1	2	8	6	4
5	3	1	7	8	2	4	6
5	3	7	1	2	8	6	4
3	5	7	1	8	2	4	6
5	3	1	7	2	8	6	4
3	5	1	7	2	8	4	6
3	1	5	2	7	4	8	6
1	3	5	2	4	7	6	8
3	1	2	5	7	4	8	6
1	3	2	5	4	7	6	8
1	2	3	4	5	6	7	8

and Dodging Movements within the Principle needs not be symmetrical.

And each Stunt is, strictly, symmetrical but the arrangement of the Stunts within the Divisions needs not be symmetrical. Neither is there any essential need for the Stunts in one Division to be similar to those in another. Of course the Capacity of the Method of producing the full Effect of the Row depends largely on its symmetry and the regularity of its Divisions, but that is a point which does not concern us here.

On page 102 is an Example of a Method founded on an unsymmetrical Principle, which has also unequal Divisions, some of the Divisions not being symmetrical. It will be seen that in all essential things its construction is similar to that of the other Methods given as Illustrations.

As all the Examples given are produced from Principles by means of Stunts, so every Method in Group I in which the Division Heads and Ends are in the

same Causing Order, are produced. There is no exception.

Subdivision C. Methods in which a Plunti begun in one Division is Continued and completed in one or more other Divisions.

It seems to be the general opinion that the Construction of Group I Methods depends on (a) having a Division End which will repeat the required number of times; and (b) on all the Divisions being exactly similar.
Thus you write down a number of Rows or x Bells to form your first Division. The Division End is a Row which will repeat x-1 times. You repeat the whole Division x-1 times and you have your plain Course.
Different men insist on various other conditions. Some for instance that the Divisions should be symmetrical. Some that the Division Heads and Ends should be in the same Causing Order. But these conditions are secondary, the others are essential.

Now, if the essential thing about the construction of these Methods is that the Division End should repeat the required number of times, then clearly any set of Rows which will so repeat is valid. BB Major Lead Ends (i.e. Division Heads and Ends that are all in the same Causing Order) might be, for other reasons, superior, but essentially they would be one set among many sets. "Of Course," to quote Sir Arthur Heywood, "there are scores of lead ends that will produce a cycle", and if the above hypothesis is sound he was right to argue that they are all of equal value.

But we saw that in the case of Methods in which the Division Heads and Ends are all in the same Causing Order, the length of the Course and the number of Divisions depend on the Principle (i.e. on the primary cyclical movement in which all the bells are concerned, and not on the ability of the Division Ends to repeat, or on the Divisions being exactly similar. The Stunt in 3-4

in the first Division of Forward is complete.
in itself, and has no Constructional Connection

1	2	3	4	5	6
2	1	4	3	6	5
1	2	4	3	5	6
2	1	3	4	6	5
2	3	1	6	4	5
3	2	6	1	5	4
2	3	1	6	4	5
3	2	6	1	5	4
3	6	2	5	1	4
6	3	5	2	4	1
3	6	2	5	1	4
6	3	5	2	4	1
6	5	3	4	2	1
5	6	4	3	1	2
6	5	4	3	2	1
5	6	3	4	1	2
5	3	6	1	4	2
3	5	1	6	2	4
5	3	6	1	4	2
3	5	1	6	2	4
3	1	5	2	6	4
1	3	2	5	4	6
3	1	5	2	6	4
1	3	2	5	4	6
1	2	3	4	5	6

with the similar Shunts in other Divisions. Clearly it must be equally true that any similar Shunt begun in one Division and completed in another is also self-contained and independent. It has no effect except so far as the two bells making it are immediately concerned. It obscures the "Bob Major Lead Ends" of the Principle but they remain the "natural" Division Heads and Ends of the Course. And as in the case of the Methods we have previously considered the Principle remains the one thing which settles the length of the Course and the number and size of the Divisions.

A The PRINCIPLE

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
8	7	6	5	4	3	2	1

C. DUFFIELD MAJOR

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	4	6	3	5	7	8
2	1	6	4	5	3	8	7
1	2	6	5	4	3	7	8
2	1	5	6	3	4	8	7
2	5	1	3	6	8	4	7
5	2	3	1	8	6	7	4
2	5	3	8	1	6	4	7
5	2	8	3	6	1	7	4
2	5	8	6	8	1	4	7
5	2	6	8	1	3	7	4
5	6	2	1	8	7	3	4
6	5	1	2	7	8	4	3
5	6	1	7	2	8	3	4
6	5	7	1	8	2	4	3
5	6	7	8	1	2	3	4
6	5	8	7	2	1	4	3
6	8	5	2	7	4	1	3
8	6	2	5	4	7	3	1
6	8	2	4	5	7	1	3
8	6	4	2	7	5	3	1
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
8	7	6	5	4	3	2	1

A is the Double Dodging Principle on eight bells.

B is produced from A by making five Complete Shuntis in each Division, each Shunt being a backward Hunting Course on five bells.

C is produced from B by eight independent Shuntis (four in each half of the Course)

A Shunt on 6-3 is begun in the first Division and Completed in the second

A Shunt on 4-5 is begun in the first Division and Completed in the fourth

A Shunt on 1-8 is begun in the second Division and Completed

in the third. And so on.

This clearly shows that Duffield Major is produced by a number of cyclical movements just as much as Forward Major is. And in the same way it can be shown that every Round Block is so produced.

On page 109 I give another example.

B is produced from the Principle, by a number of Shunts each consisting of Hunting Causes on five bells.

C is produced from B. by a number of Shunts each of which consists of substituting two Dodging Movements for a Hunting Cause on five bells.

A B		A B
B A	instead of.	A B
A B		B A
B A		B A.

In each Division of C. the result of the Shunts is that three bells take three steps in a Backward Hunting Cause, — that is, exactly half the complete cycle. Three steps Forward is also exactly half the complete

A. The Principle

1	2	3	4	5	6	7	8
1	3	2	5	4	7	6	8
1	2	3	4	5	6	7	8
1	3	2	5	4	7	6	8
3	1	5	2	7	4	8	6
3	5	1	7	2	8	4	6
3	1	5	2	7	4	8	6
3	5	1	7	2	8	4	6
5	3	7	1	8	2	6	4
5	7	3	8	1	6	2	4
5	3	7	1	8	2	6	4
5	7	3	8	1	6	2	4
7	5	8	3	6	1	4	2
7	8	5	6	3	4	1	2
7	5	8	3	6	1	4	2
7	8	5	6	3	4	1	2
8	7	6	5	4	3	2	1

B.

1	2	3	4	5	6	7	8
1	2	3	5	4	6	7	8
1	3	2	4	5	7	6	8
1	3	2	5	4	7	6	8
3	1	5	2	7	4	8	6
3	1	5	7	2	4	8	6
3	5	1	2	7	8	4	6
3	5	1	7	2	8	4	6
5	3	7	1	8	2	6	4
5	3	7	8	1	2	6	4
5	7	3	1	8	6	2	4
5	7	3	8	1	6	2	4
7	5	8	3	6	1	4	2
7	5	8	6	3	4	4	2
7	8	5	3	6	4	1	2
7	8	5	6	3	4	1	2
8	7	6	5	4	3	2	1

C. CONWAY MAJOR

1	2	3	4	5	6	7	8
2	1	3	5	4	6	8	7
2	3	1	4	5	8	6	7
3	2	1	5	4	8	7	6
2	3	5	1	8	4	6	7
3	2	5	8	1	4	7	6
3	5	2	1	8	7	4	6
5	3	2	8	1	7	6	4
3	5	8	2	7	1	4	6
5	3	8	7	2	1	6	4
5	8	3	2	7	6	1	4
8	5	3	7	2	6	4	1
5	8	7	3	6	2	1	4
8	5	7	6	3	2	4	1
8	7	5	3	6	4	2	1
7	8	5	6	3	4	1	2
8	7	6	5	4	3	2	1

D. BANGOR MAJOR.

1	2	3	4	5	6	7	8
2	1	3	5	4	7	6	8
2	3	1	4	5	7	8	6
3	2	1	5	4	8	7	6
2	3	5	1	8	4	6	7
3	2	5	8	1	6	4	7
3	5	2	1	8	6	7	4
5	3	2	8	1	7	6	4
3	5	8	2	7	1	4	6
5	3	8	7	2	4	1	6
5	8	3	2	7	4	6	1
8	5	3	7	2	6	4	1
5	8	7	3	6	2	1	4
8	5	7	6	3	1	2	4
8	7	5	3	6	1	4	2
7	8	5	6	3	4	1	2
8	7	6	5	4	3	2	1

cycle and brings the bells to the same point. Therefore one can be substituted for the other

6 7 8		6 7 8
7 6 8	instead of	6 8 7
7 8 6		8 6 7
8 7 6		8 7 6.

This Shunt made in each Division produces D.

These Last five Methods, Conway and Bangor (p. 109) raise a rather important point. I have pointed out that every Round Block must consist of a number of Complete cyclical movements on all or part of the bells; either of full Cycles, or of forward and backwards movement along arcs of Cycles; yet in these two Methods we have, since in each Division, three bells which make Lady a Hunting Course only, and the second Lady is made nowhere, neither in the same Division nor in any other Division. Does this not prove that my statement

is wrong? No. The truth is that not every case, where a number of bells is running together, is part of one of the Movements in the Construction of the Method. These two Methods actually are produced by a number of complete cyclical movements, as I have shown. As a result of these movements some of the bells do part of other movements; but these latter are only accidental and need not be completed.

Similarly if in any Method certain bells begin a Hunting Course among themselves, it does not follow that that Hunting Course will be completed. But it is certain that the movement of the bells, (and all the movements of the bells), is part of some cycle or arc (or cycles or arcs) which must be completed before the bells can return to the Row from which they started.*

* In the case of an arc the bells must traverse it and return along it to its starting point.

Extreme Bells. These are more usually called "Working" Bells. But as this term is liable to cause misunderstanding I revert to the older and better term.

Chapter VII

Hunts.

A Hunt is a Bell that performs a cyclical movement through the Changing Order of other Bells which are called Extreme Bells.

Before explaining what a Hunt is, it will be well to say what it is not. It is not, necessarily, a bell which has a simple or regular path, or one that is repeated a number of times. A Hunt's path may be both simple and regular, and it may be repeated, but it may also be complex and irregular.

A Hunt is a bell which does a distinct and important Constructional work; one of the most important in the whole Science of Ringing

The term is one of the oldest we

have, and from the earliest times it was used for this Continental work. Stedman informs us that the first step in the development of ringing was "the invention of the Trebles". He goes on to explain that the Trebles were not rung as Hunting Courses, as they could have been rung, and as we should have expected them to be rung, but as Hunt and Exclusive Bells. He then fully describes this way of ringing them. What a Hunt was to the Ancients can be seen from Fig 1. It is the cyclical path of one bell (in the Ex. the Treble) through the other bells until it returns to its original position. The Hunt moves, the other bells lie still, except when each has to make way for the Treble. Really what is going on is a Continual alteration in the relative positions of the Hunt on the one hand, and

Fig 1.

1	2	3	4
2	1	3	4
2	3	1	4
2	3	4	1
3	2	4	1
3	2	1	4
3	1	2	4
1	3	2	4
1	2	3	4

the Extreme Bells on the other hand. The Extreme Bells retain the same relative positions among themselves, but as their positions relative to the Hunt are continually changing, they share the movement equally with that bell. This is shown clearly, and in a most instructive way, in the fourth Change. Here the Hunt is lying its whole pull behind. If the Extreme Bells also continued to lie still, the relative movement would cease. To keep carry on that movement, as the Hunt is lying still, the Extreme Bells must move, — they must make what the Ancients called an Extreme Change.

The following things can clearly be seen from the Example 1.; and they are the important characteristics of all operations consisting of Hunts and Extreme Bells.

1. The operation divides the bells into two kinds.

(a) The Hunt (or Hunts)

(b) the Extreme Bells.

2. So far as the operation is concerned the Hunts (if there be more than one) retain the same relation to each other throughout; and the Extreme Bells retain the same relation to each other throughout.

3. But the relation of the Hunt (or Hunts) to the Extreme Bells is altered at every Change.

4. The Hunts' path consists of changing positions with each of the Extreme Bells, as it comes to it. It can change position with only one bell at a time and only with the bell next to it.

5. The Hunts' path is cyclical. If it begin by changing positions with the Bell next after it, and if the movement thus begun is persisted in, it will return to the position from which it started, by completing the cycle; changing

positions on the way with all the Extreme Bells in due order.

Fig II

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	3	6	5	8	7
4	2	3	1	6	5	8	7
4	3	2	6	1	5	8	7
4	3	6	2	5	1	8	7
4	3	6	5	2	8	1	7
4	3	6	5	8	2	7	1
4	3	6	5	8	7	2	1
3	4	5	6	7	8	1	2
3	4	5	6	7	1	8	2
3	4	5	6	1	7	2	8
3	4	5	1	6	2	7	8
3	4	1	5	2	6	7	8
3	1	4	2	5	6	7	8
1	3	2	4	5	6	7	8
1	2	3	4	5	6	7	8

Fig II shows a Round Block with two Hunts (1 and 2) and six Extreme Bells, and it will be seen that it is similar to Fig I (page 113).

The two Hunts retain the same relationship to each other; but this relationship is not the same relation in position but in Coming Order.

This has got to be borne in mind to understand the nature of a Hunt. Bells in the same relationship means bells which are at the same time doing the same cycle, whether they be Hunts or Extreme Bells. In Fig. II the two

Hunts are both, at the same time, doing Plain Forward Hunting.

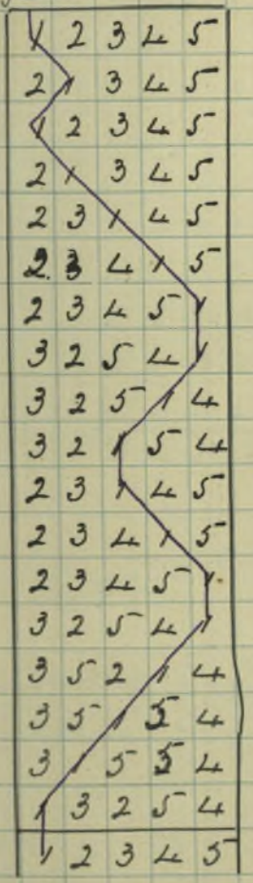
The Extreme Bells are not actually doing a cycle, but they are in the position of all doing the same cycle at the same time. There is potential movement among themselves, besides being relative movement as regards the Hunts.

In modern forms of ringing this potential movement does not occur; or occurs only in an obscure manner. But potential movement is to be considered a real thing in the Science of Ringing and since it is potentially cyclical it has Causing Order.

Thus, the operation of Hunt and Extreme Bells is the interworking of two cyclical movements; one, that of the Hunts, with a Common Causing Order; the other that of the Extremes with a Common Causing Order. And the two cycles will each be repeated until the Completion of one Coincides with the Completion of the other,

when the original Causing Order of all the Bells is regained, and the Bells return to the Row from which they started.

Fig III



movement.

Fig III shows a Hunt with a more complex path. It is still strictly cyclical, but instead of doing a complete cycle straight off, it introduces Dodging movements into its path. all the laws of cyclical movement and of Hunts are however obeyed to the letter.

This example too furnishes an illustration of Hunts in more complex methods; the potential movement of the Extreme Bells being replaced by actual cyclical

Fig IV

1	2	3	4	5	6	7	8	←	2 1 3 5 7 8 6 4 a
1	3	2	5	4	7	6	8		
1	3	5	2	7	4	8	6	←	2 3 1 5 7 8 6 4 b.
1	5	3	7	2	8	4	6		
1	5	7	3	8	2	6	4	←	2 3 5 1 7 8 6 4 c
1	7	5	8	3	6	2	4		
1	7	8	5	6	3	4	2	←	2 3 5 7 1 8 6 4 d.
1	8	7	6	5	4	3	2		
1	8	6	7	4	5	2	3	←	2 3 5 7 8 1 6 4 e
1	6	8	4	7	2	5	3		
1	6	4	8	2	7	3	5	←	2 3 5 7 8 6 1 4 f
1	4	6	2	8	3	7	5		
1	4	2	6	3	8	5	7	←	2 3 5 7 8 6 4 1 g
1	2	4	3	6	5	8	7		
1	2	3	4	5	6	7	8		

Coursing Order.

Fig V

The Coursing Order.

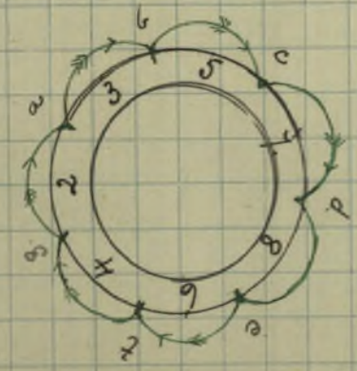


Fig IV (page 119) is another illustration of Hunt and Extreme Bells.

The first Change — 1 2 3 4 5 6 7 8
1 3 2 5 4 7 6 8 —

is backward movement on all the Bells and if continued will produce a complete Hunting Course second

But in the Third Change a secondary movement is introduced. In addition to the the Cyclical movement of all the bells a movement is begun by 1 and 3 changing positions.

If the primary cycle only were made, the second Change would be —

1 3 2 5 4 7 6 8
3 1 5 2 7 4 8 6.

and if added to this a secondary cycle is begun by 1-3 changing positions, the second Change will be —

1 3 2 5 4 7 6 8
1 3 5 2 7 4 8 6.

The primary cycle is now resumed, and the third change will be —

1 3 5 2 7 4 8 6
1 5 3 7 2 8 4 6.

The result of this double movement is first, that the treble remains on the

Lead. This is however not because of absence of movement, but as the result of two movements, one positive and the other negative.

And, second, the Running Order of the bells is altered by 1 and 3 changing positions. The Running Order of the first Change is —

2 1 3 5 7 8 6 4

That of the third Change is 2 3 1 5 7 8 6 4

In the fourth Change the treble changes positions with the 5.

1 5 3 7 2 8 4 6

1 5 7 3 8 2 6 4

and in the fifth Change, where all the bells are doing the primary cycle, the Running Order is —

2 3 5 1 7 8 6 4

Similarly as each Exclusive Bell, comes to the Hunt, those two bells change positions, until the Hunt has completed a cycle as shown in Fig V (p. 119) when the treble is again between 2 and 3, the original Running

2 1 3 5 7 8 6 4
2 3 1 5 7 8 6 4
2 3 5 1 7 8 6 4
2 3 5 7 1 8 6 4
2 3 5 7 8 1 6 4
2 3 5 7 8 6 1 4
2 3 5 7 8 6 4 1

Order of all the bells is regained, and the bells return to the Row from which they started.

The peculiarity of this cyclical movement of the Hunts is that the Extreme Bells make a complete Hunting Course among themselves.

The primary movement on all the bells is Backwards.

The Hunting Course of the Extreme Bells is the opposite and therefore Forward.

The Construction of the Blocks shown in Fig IV (p 119) consists of three complete cycles.

1. The primary cycle of all the bells.
2. The cycle of the Hunts in Counting order.
3. The Hunting Course of the Extreme Bells.

In Fig IV the Hunts is one bell. Figs. VI. VIII X (TP 123-4-5) show similar Blocks with two bells as Hunts.

In Fig VIII the Hunts perform a Hunting Course among themselves. In Fig X they perform Dodging Movements among themselves.

Fig VI.

1	2	3	4	5	6	7	8	
1	2	4	3	6	5	8	7	
1	2	4	6	3	8	5	7	
1	2	6	4	8	3	7	5	
1	2	6	8	4	7	3	5	
1	2	8	6	7	4	5	3	
1	2	8	7	6	5	4	3	
1	2	7	8	5	6	3	4	
1	2	7	5	8	3	6	4	
1	2	5	7	3	8	4	6	
1	2	5	3	7	4	8	6	
1	2	3	5	4	7	6	8	
1	2	3	4	5	6	7	8	

Coursing Order.

← 3 12 4 6 8 7 5 a

← 3 4 12 6 8 7 5 b.

← 3 4 6 12 8 7 5 c

← 3 4 6 8 12 7 5 d.

← 3 4 6 8 7 12 5 e

← 3 4 6 8 7 5 12. f

Fig VII

The Coursing Order.

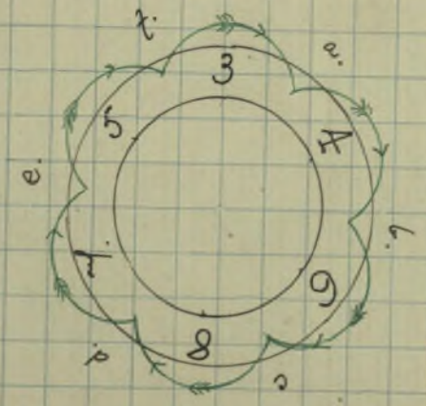


Fig VIII

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	1	4	6	3	8	5	7
1	2	6	4	8	3	7	5
1	2	6	8	4	7	3	5
2	1	8	6	7	4	5	3
2	1	8	7	6	5	4	3
1	2	7	8	5	6	3	4
1	2	7	5	8	3	6	4
2	1	5	7	3	8	4	6
2	1	5	3	7	4	8	6
1	2	3	5	4	7	6	8
1	2	3	4	5	6	7	8

Coursing Order.

← 3 1 2 4 6 8 7 5 a

← 3 4 2 1 6 8 7 5 b.

← 3 4 6 1 2 8 7 5 c

← 3 4 6 8 2 1 7 5 d.

← 3 4 6 8 7 1 2 5 e

← 3 4 6 8 7 5 2 1 f.

Fig IX

The Coursing Order.

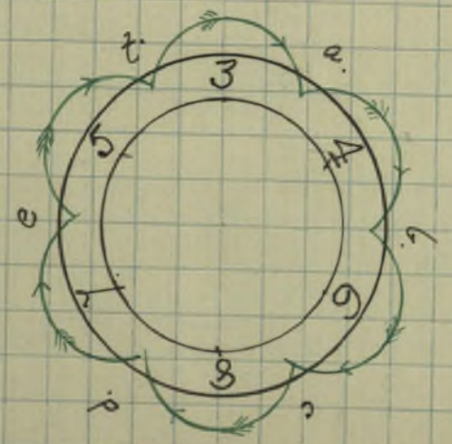


Fig X.

1	2	3	4	5	6	7	8	←	3 1 2 4 6 8 7 5 a
2	1	4	3	6	5	8	7		
1	2	4	6	3	8	5	7	←	3 4 1 2 6 8 7 5 b
2	1	6	4	8	3	7	5		
1	2	6	8	4	7	3	5	←	3 4 6 1 2 8 7 5 c
2	1	8	6	7	4	5	3		
1	2	8	7	6	5	4	3	←	3 4 6 8 1 2 7 5 d
2	1	7	8	5	6	3	4		
1	2	7	5	8	3	6	4	←	3 4 6 8 7 1 2 5 e
2	1	5	7	3	8	4	6		
1	2	5	3	7	4	8	6	←	3 4 6 8 7 5 1 2 f
2	1	3	5	4	7	6	8		
1	2	3	4	5	6	7	8		

Fig XI

The Coursing Order.

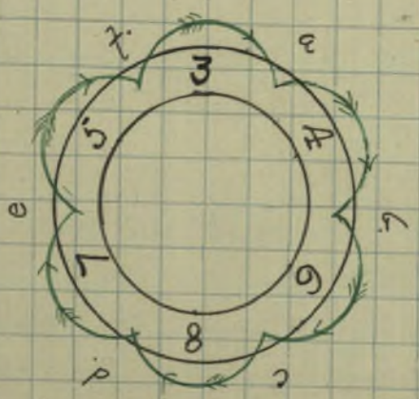


Fig XII

Let Fig XII represent the Coursing order of any Principle.

To be an accurate illustration, this figure should be doubly cyclical -

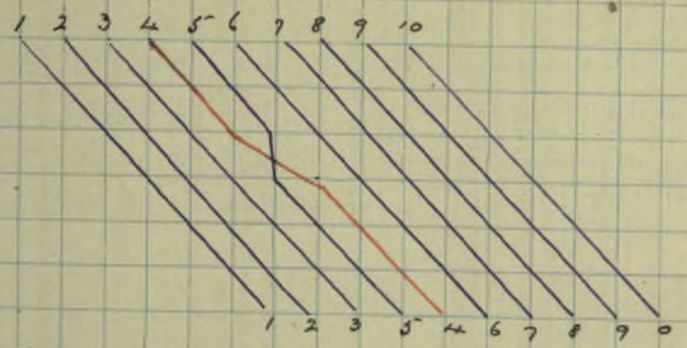
1. each line should be a cycle
2. the order of the lines should be in a cycle, the first one following the last.

Such a figure, of course, cannot be put down on paper, but it must be understood.

Ex. Fig. XII Let one bell - 4 - be a Hunt. It can change positions either with the bell Coursing next before it, or the one Coursing next after it.

Let it change with the bell next after it - 5 -.

Fig XIII



This introduces a fresh Counting Order. The bells cannot return to the Row from which they started until the original Counting Order is regained.

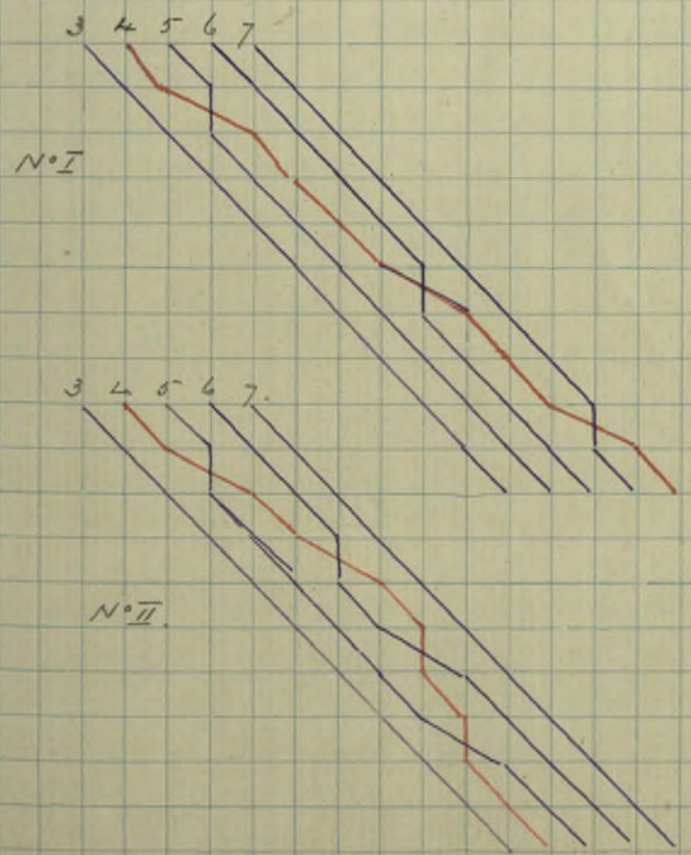
If the remains a Hunt and 1,2,3,5,6,7,8,9,0 remain Exclusive Bells, the original Counting Order can be regained only in one of three ways.

1. The Hunt can complete its cyclical path in Counting Order, changing positions successively with each of the Extreme Bells as it meets them.

2. Having changed positions with one or more Extreme Bells, it can regain its original positions by changing positions with the same bells, but in reverse order.

3. A Combination of 1- and 2.

These three are the equivalents of the Plain Hunting, the Dodging Movement, and the mixed Plain Hunting and Dodging Movement



One of the best Examples of a Hunt and Exclusive Bells, and one where practical ringing in the lower plans the nature of a Hunt, is the Plain Course of Bob Major.

When you start ringing it from Rounds, the order you meet the bells (which is the Ringing Order) is 12345678

Immediately after 2nds is made at the first Lead End the order is —

13246875

The working bells are all in the same order as in the first Lead, but 1 and 3 have changed positions, the tenor is between 3 and 5 instead of between 2 and 3.

In the third Lead, the tenor and 5 have changed positions, and the tenor is between 5 and 7.

In the fourth Lead 1 and 7 have changed positions, and the tenor is between 7 and 8

In the fifth Lead, 1 and 8 have changed positions, and the tenor is between 8 and 6.

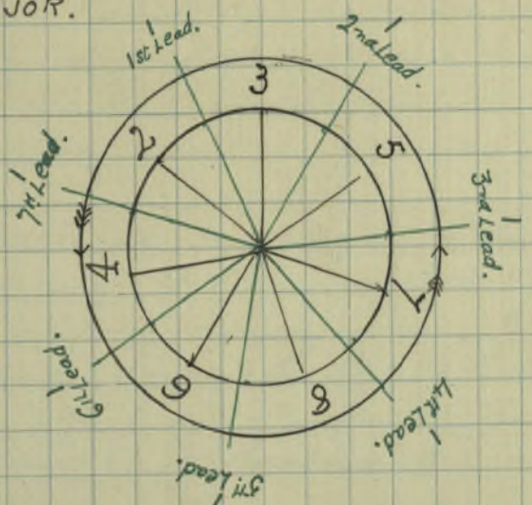
In the sixth Lead, 1 and 6 have changed positions, and the tenor is

between 6 and 4.
In the seventh Lead, the Treble has changed positions with the 4th, and is between 4 and 2.
At the Last Lead end 1 and 2 change positions, and the Treble is between 2 and 3.
This is her first position, the original Counting Order is regained, and the bells return to the Row from which they started.

All through the Working Bells keep the same Counting Order, and during the Course the Treble makes a complete cycle through them, changing position in Counting Order with one at a time, in the order in which it comes next them.

It is this Cyclical movement, that makes the Treble a Hunt, not its regular, unanticipated, and repeated Hunting Path.

The Plain Course of
BOB. MAJOR.



Coursing Order.

First.	Lead	2	4	6	8	7	5	3	1
Second.	do	2	4	6	8	7	5	1	3
Third.	do	2	4	6	8	7	1	5	3
Fourth	do	2	4	6	8	1	7	5	3
Fifth.	do	2	4	6	1	8	7	5	3
Sixth.	do	2	4	1	6	8	7	5	3
Seventh.	do	2	1	4	6	8	7	5	3
First	do.	1	2	4	6	8	7	5	3

The Division of the Plain Course of Bob Major into equal Leads, and the number of Leads, depend on the number of

steps the Hunt has to make to complete its Cyclical movement; and not on the Lead End and its Capacity to repeat the required number of times.

The cyclical movement of the Hunt in Causing Order involves the Extreme Bells making a secondary Cycle Consisting of a Hunting Course which (as the Primary Cycle of the Principle is forward) is backward.

1	2	3	4	5	6	7	8	
1	3	2	5	4	7	6	8	
1	3	5	2	7	4	8	6	
1	5	3	7	2	8	4	6	
1	5	7	3	8	2	6	4	
1	7	5	8	3	6	2	4	
1	7	8	5	6	3	4	2	
1	8	7	6	5	4	3	2	
1	8	6	7	4	5	2	3	
1	6	8	4	7	2	5	3	
1	6	4	8	2	7	3	5	
1	4	6	2	8	3	7	5	
1	4	2	6	3	8	5	7	
1	2	4	3	6	5	8	7	
1	2	3	4	5	6	7	8	

This will be seen to be identical with the Block given on page. 119.

And so we get the three Cyclical movements which are characteristic of all Hunt and Extreme Bells:-

1. The Primary Cycle of the Principle;
2. The Cycle of.

The Hunt in Coursing Order;
3. The Hunting Course on the Extreme bells.

Fig XVI.

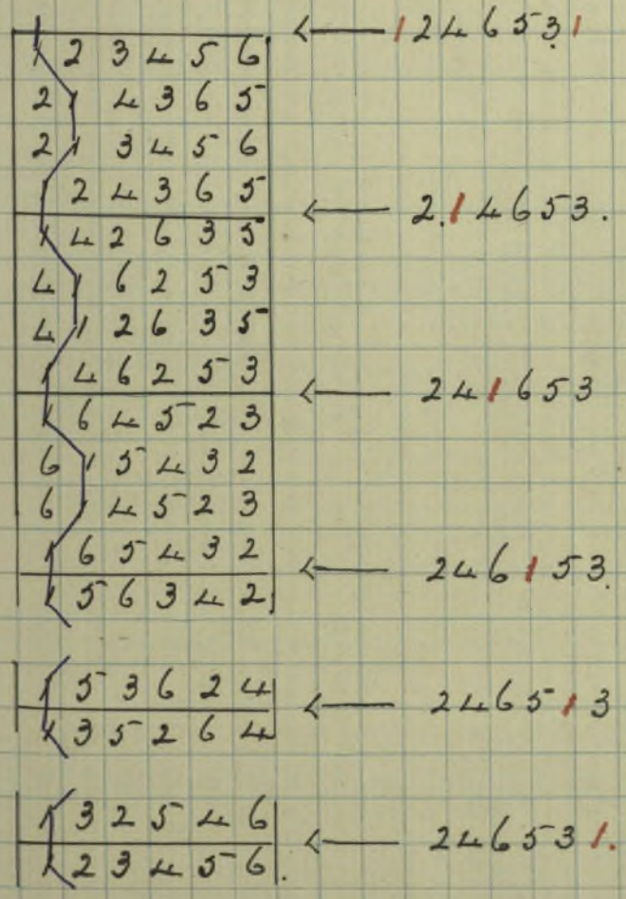
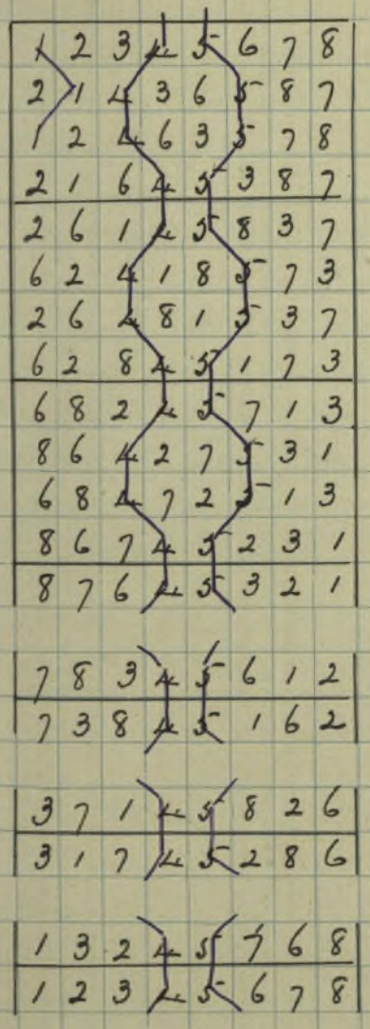


Fig. XVII

The Coursing Order.



← 24687531.

← 26458731

← 26487351

← 26845731

← 26847315

← 26874531.

← 25687431

← 26873451

← 26587341

← 26873145

← 26857314

← 24568731.

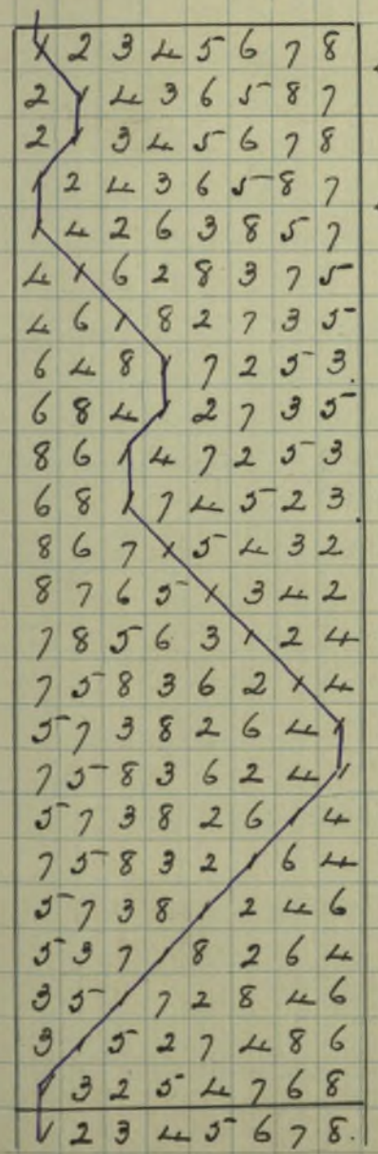
← 24687531

Figs. XVI (p 133) and XVII (p. 134) are two further illustrations of Hunts and Extreme Bells. The first has one Hunt, the second two.

In all these illustrations the Hunt has a regular path; its steps in Causing Order are symmetrically arranged; and the result is, in each case, a symmetrical Course, which is divided into as many Divisions or Leads as there are steps in the Hunts cyclical path in Causing Order.

Fig XVIII is an illustration of a Hunt which has an irregular path and a Course which is not divided into equal Leads. It is however a fine Construction by Hunts and Extreme Bells: The Treble is the Hunt. First it changes positions in C.O. with 2. Then with 4. Then with 2 again. And again with 2. Which brings it back to its original position. It has made a Dodging Movement in Causing Order.

Fig XVIII.



Coursing Order.

← 6 8 7 5 3 1 2 4

← 6 8 7 5 3 2 1 4

←

← 6 8 7 5 3 2 4 1

← 6 8 7 5 3 2 1 4

← 6 8 7 5 3 1 2 4

The Construction which Consists of Hunt and Extreme Bells is the interworking of two Cycles; and as all Cycles are Essentially of the same nature, it follows that wherever you have two Cycles you have Hunt and Extreme Bells. Further since all Construction Consists of breaking and regaining Causing Order, and this can only be done by different Cycles or some part of the Bells, it follows that there are Hunts and Extreme Bells in every Cause or Block other than the Principles.

This is so even in the case of Group I Methods, which are usually supposed to have no Hunts. For instance the first Division of Barnsbury Major (Pg 90). Here 1, 2, 7, 8 are Hunts, 3, 4, 5, 6 are Extreme Bells.

The Causing Order is:—

3	1	2	4		6	8	7	5	
3			4	8	7	6		5	1 2.
3	8	7	4			6	1	2	5
3			4	1	2.	6		5	8 7.
3	1	2.	4			6	8	7.	5

* "Grandsire" p. 116

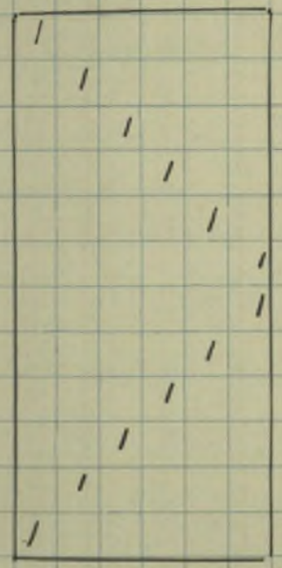
See Tintinnalogia p. 90.

As I have already pointed out the use of the Hunt was the first step in composition and it was by Hunts that the Ancients produced all their "peals", a peal being any Round Block. Snowdon says that Grandsire Bob was what we now call Plain Bob.* But that is not strictly true. Plain Bob is a Method which has a Plain Course from which you get touches and peals by certain recognised Bobs and Singles. Grandsire Bob was a particular arrangement of Hunts and had no Plain Course in the modern sense of the term.

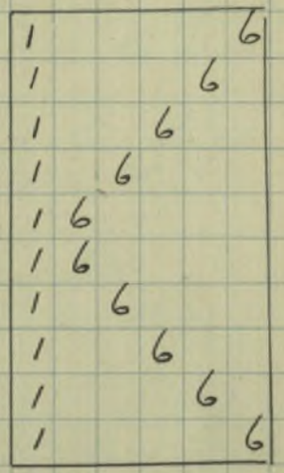
One bell (usually but not necessarily the Treble) was selected as the Whole Hunt. This did a regular repeated plain Tumbling Cycle.

Another bell (the Fifth or another) was the Half Hunt. This, while sharing the primary cycle of the Whole Hunt, performed a secondary cycle which caused it to fall into every different position relative to the Whole Hunt

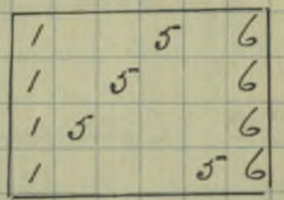
(a) The Whole Hunt



(b) The Half Hunt.



The Quarter Hunt



A third bell was the Quarter Hunt. This, while placing the other two cycles, did a tertiary cycle, which caused it to fall into every different position relative to the Whole Hunt and the Half Hunt.

The three remaining Bells were the Extreme Bells, and they do

The Extreme Bells.

a cycle among themselves consisting of a complete Hunting Course.

This gave 360 Rows and to produce the 720 a Single was made halfway and end. The effect of this Single is to make the 2nd a Hunt and to produce a Hunting Course on 3-4. The Ancients could have called the 2nd a Half-Quarter Hunt.

By the use of Hunts, in a similar way, Annable produced his 6-part peal of Bob Triples* and his well known 3 part peal of Bob Major**, and by carrying the same construction still further. I produced the full Extent of Bob Maximus, 479,001,600 changes†. There is nothing really in the composition of this Catch which is not a Logical development of "R.R"'s Grandsire Bob; and on the same plan a Tenor can be produced without much difficulty, which will give the full extent of Plain Bob on all numbers to sixteen.

Earlham's peal of Grandsire Triples, and all the Bob and Single peals in

* Hubbard. 4th Ed. p. 54
* C.C. Collection of Peals Section II p. 174

† C.C. Collection of Peals Section II p 251.

* Tintinnalogia p. 27.

that method are produced by Hunts; so too are the peals of Plain Bob, Double Norwich etc on the 5-course plan. Earlier still than any of these * examples, are the 720's of Plain Changes. These are logical developments of the "Pisces". So far from being "crude" and melancholy Lords of ringing, they are as scientifically constructed as the best of modern peals, and they show clearer than most, the one fundamental law of composition, the law of cyclical movement. Plain Changes differ from modern peals in this thing only,- that the first are based on potential movement, and the second on the movement of a Principle.

The idea of the Ancients was not only to use Hunts in composition, but to use them symmetrically. This naturally restricted compositions to very narrow limits. Later composers retained the symmetrical limits so far as the Course is concerned, but to get greater variety introduced bobs and singles as they thought

Thomas Melchior

See Letter by ~~Edward Crane~~ in the Norwich Gazette Dec 11 1731. "If John Garthon had been alive he would have laughed at your Ignorance for assigning Hunts to Stedman's Triples."

* A Note on GRANDSIRE TRIPLES by W.H. Thompson 1886.

fit. By doing so they fancied they had dropped altogether the idea of Hunts for peal composition. They did not recognise that there are, and must be, strict laws which govern the relationship of different bobs in a peal. Composition has, with them almost entirely a matter of Experiment, and it was only in recent years that Mr Thompson showed that in any 5040 of Grandsire Triples the bobs must be arranged in what he called "a set." * Later still it has been generally recognised that the law of "a set" is a universal one for peals in all Methods.

But a set is only another name for a Combination Consisting of Hunt and Extreme Bells.

The bob making bells are Extreme Bells; they retain the same Running Order among themselves, and they make a complete Hunting Course.

The other bells are Hunts; they make a complete Cyclical movement through the Running Order of the

bob-making bells.

Examine a peal in any method. Take Grandsire Triples. Call a Bob in the Plain Course when the 3rd is Before and Complete the peal.

3	1	5	2	7	4	6
1	3	5	7	2	6	4
3	1	7	5	6	2	4
1	3	7	6	5	4	2
3	1	6	7	4	5	2
1	3	6	4	7	2	5
3	1	4	6	2	7	5
1	3	4	2	6	5	7
3	1	2	4	5	6	7
1	3	2	5	4	7	6

Coursing Order.

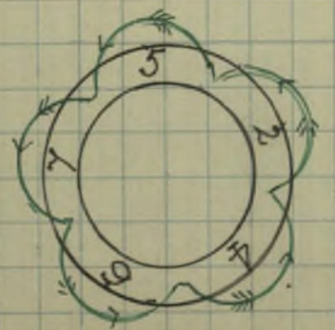
31 5 2 4 6 7 31.

5 2 4 6 31 7

5 2 4 31 6 7

5 2 31 4 6 7

5 31 2 4 6 7.



Compare this with Fig X p. 125.

Take Bob Major, Double Oxford Major London, Cambridge, Superlative etc. Call a bob at R in the Plain Course and complete the 9 set.

1	2	4	3	6	5	8	7	
1	4	2	3	5	6	7	8	
1	4	3	2	6	5	8	7	
1	3	4	2	5	6	7	8	
1	3	2	4	6	5	8	7	
1	2	3	4	5	6	7	8	

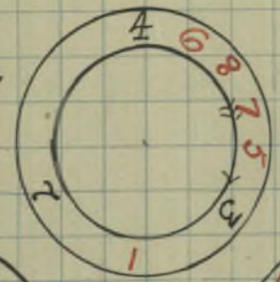
Coursing Order.

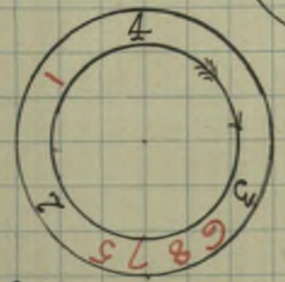
1 4 3 6 8 7 5 2.

6 8 7 5 4 1 3 2.

4 6 8 7 5 3 1 2.

C.O. 1st Course





C.O. 2nd. Course

C.O. 3rd Course

A "q peli" q Oxford and Kent Major

Coursing Order.

1	8	7	6	5	4	3	2						
1	7	8	6	4	5	2	3	8	1	7	6	5	3	2	4	8	1	7
1	8	7	4	6	2	5	3						
1	7	8	4	2	6	3	5	6	5	3	2	8	1	7	4
1	8	7	2	4	3	6	5						
1	7	8	2	3	4	5	6	6	5	3	8	1	7	2	4
1	8	7	3	2	5	4	6						
1	7	8	3	5	2	6	4	6	5	8	1	7	3	2	4
1	8	7	5	3	6	2	4						
1	7	8	5	6	3	4	2	6	8	1	7	5	3	2	4

A q peli q Double Norwich C.B. Major

1	6	8	4	7	2	5	3
1	8	6	7	4	2	3	5
1	6	8	4	7	3	2	5
1	8	6	7	4	3	5	2
1	6	8	4	7	5	3	2
1	8	6	7	4	5	2	3

2 5 3 4 6 1 8 7

2 5 4 6 1 8 7 3

2 4 6 1 8 7 5 3

Thus Mr Thompsons Law of 2 sets is really a development of the original truth on which the Ancients based their peals, but in different terms, and on wider lines. And it is most significant that the idea which was in the minds of the earliest of all change ringers when they invented the Pisces, should be proved to be the one important truth which lies at the base of all composition. And surely, since it is now generally recognised in the case of peal Compositions, it should not be difficult for men to recognise that the same truth must apply to the Construction of Methods

Chapter VIII

Methods which are founded on Hunts & Working Bells.

Every Round Block except the Principles, and therefore every Method except Original, must contain Hunts and Extreme Bells in some form or other. But, as we saw, the main construction of Group I Methods depends on the Principle. The length of the Course is the length of the Principle; the Divisions of the Course are the Divisions of the Principle. The Hunts are secondary.

In Group II Methods the main construction is that of a Hunt (or Hunts) and Extreme Bells. The Course consists of the cyclical path of the Hunt through the Running Order of the Extreme Bells, and the number of Leads depends on the number of steps in that path. In many cases there will be secondary movements consisting of Hunts and

the former

Extreme Bells, but in all cases there will be the main movement.

It is a postulate in this Group of Methods that the Hunt should have a regular repeated path; and we will confine ourselves for the moment to Methods in which that path is through Plain Hunting or Treble Bob Hunting.

In all these Methods the bells will share equally the Primary Movement of the Principle.

To that movement is added the secondary cyclical movement of the Extreme Bells, which causes the Hunt cyclical path in Causing Order. This movement of the Extreme Bells I call Constitutional Shunts.

In addition to this, there may be other cyclical movements or path of the Extreme Bells. These do not affect the main construction of the Course. I call them Additional Shunts.

Fig I

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
8	7	6	5	4	3	2	1
7	8	5	6	3	4	1	2
7	5	8	3	6	1	4	2
5	7	3	8	1	6	2	4
5	3	7	1	8	2	6	4
3	5	1	7	2	8	4	6
3	1	5	2	7	4	8	6
1	3	2	5	4	7	6	8
1	2	3	4	5	6	7	8

Let Fig I be the Plain Principle on x bells and in it let any one bell 1. be selected to be the Hunt of a Method; and the remainder 2, 3, 4, 5, 6, 7, 8 to be Exclusive Bells.

By the nature of a Hunt, in addition to the cyclical movement of the Principle, which is shared equally by all the bells, there will be a cyclical path of the Hunt through the Ensuing Order of the Exclusive Bells, and a cyclical movement of the Exclusive Bells, among themselves.

By the conditions of Group II Methods the Plain Hunting path of the Hunt may not be altered.

The Constructional Stents which

will comply with these conditions are classified as follows,—

A. EXTREME CONSTRUCTIONAL SHUNTS
   (a) R. Extreme Constructional Shunts
   (b) P Extreme Constructional Shunts

B. COURT SHUNTS
   (a) R. Court Shunts
   (b) P Court Shunts

C SINGLE COURT SHUNTS
   (a) R. Single Court Shunts
   (b) P. Single Court Shunts

D. SLOW WORK SHUNTS.

An EXTREME CONSTRUCTIONAL SHUNT is made as follows.;—

Position — With an odd number of Hunts, when the middle Hunt is lying its Whole Pull either Before or Behind.

With an even number of Hunts, midway between the whole pulls before or behind of the middle two Hunts.

Operation — one Backward step by.

each of the Extreme Bells.

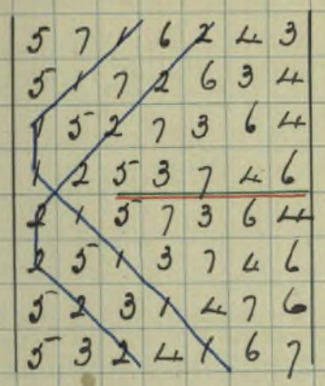
An R. Extreme Shunt is one made on an odd number of Extreme Bells. The number of Places is the same as in the Principle and therefore the Succession of the Nature of the Rows - odd and even is the same.

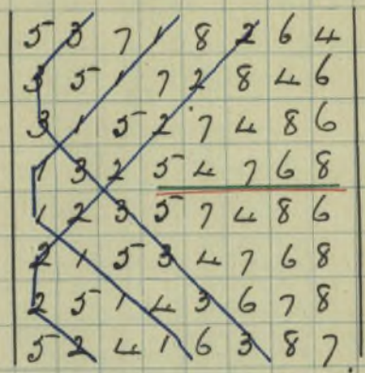
A. P. Extreme Shunt is one made on an even number of Extreme Bells. The number of Places is two more than in the Principle, and therefore the succession of the Nature of the Rows is altered.

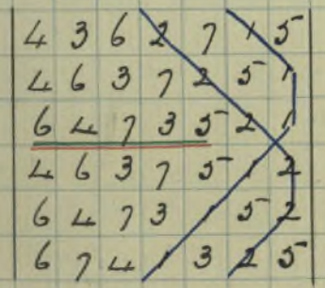
Examples of R. Extreme Shunts. -

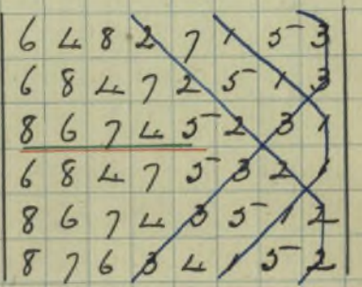
3	5	7	2	8	4	6	
3	7	5	2	7	4	8	6
7	3	2	5	4	7	6	8
7	3	5	2	7	4	8	6
3	7	2	5	4	7	6	8
3	2	7	4	5	6	7	8

6	4	8	2	7	7	5	3
6	8	4	7	2	5	7	3
8	6	7	4	5	2	3	7
6	8	4	7	2	5	3	7
8	6	7	4	5	2	7	3
8	7	6	5	4	7	2	3

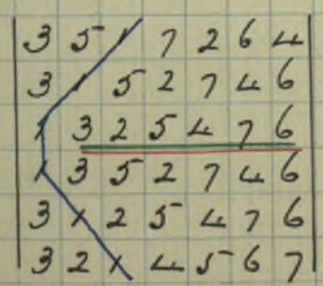


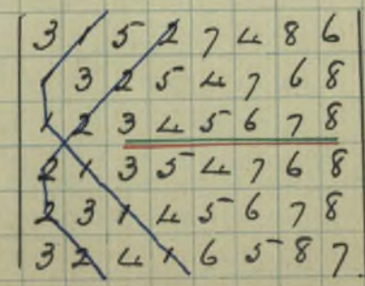






Examples of P Extreme Shunts.





One Exclieme Shuntl in each Lead,
made when the Hunt is Before gives -
with one Hunt - Plain Bob.
with two Hunts - Grandsire
with three Hunts - Plain Bob Short Courses.

One Exclieme Shuntl in each Lead,
made when the Hunt is Behind, gives -
with one Hunt - Reverse Bob.
with two Hunts - Reverse Grandsire
with three Hunts - Reverse Bob, Short
Courses.

Two Exclieme Shuntls in each Lead
one made when the Hunt is Before
and the other when the Hunt is
Behind give -
with one Hunt - Double Bob.
with two Hunts - Double Grandsire.
with three Hunts - a variation of
Double Bob.

If two Exclieme Shuntls are made in
each Lead, the Hunt will perform,
within the Course, two complete Cycles
in Coursing Order. When as many
Shuntls have been made as there are

To page 155.

1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	6	1	5	3
4	6	2	5	1	3
6	4	5	2	3	1
4	6	2	5	3	1
6	4	5	2	1	3
6	5	4	1	2	3
5	6	1	4	3	2
5	1	6	3	4	2
1	5	3	6	2	4
5	6	3	4	2	1
5	1	3	6	2	4
5	3	1	2	6	4
3	5	2	1	4	6
3	2	5	4	1	6
2	3	4	5	6	1

1	3	5	2	6	4
3	1	2	5	4	6
3	2	1	4	5	6
2	3	4	1	6	5
2	4	3	6	1	5
4	2	6	3	5	1
2	4	3	6	5	1
4	2	6	3	1	5
6	4	1	2	5	3
6	1	4	5	2	3
1	6	5	4	3	2
6	4	5	2	3	1
6	1	5	4	3	2
6	5	1	4	3	2
5	6	3	1	2	4
5	3	6	2	1	4
3	5	2	6	4	1

3	2	5	4	6	1
2	3	4	5	1	6
2	4	3	1	5	6
4	2	1	3	6	5
4	1	2	6	3	5
1	4	6	2	5	3
4	2	6	3	5	1
4	6	1	2	5	3
4	6	2	1	5	3
6	4	2	5	1	3
6	4	5	2	1	3
6	5	4	2	3	1
5	6	4	3	2	1
5	6	3	4	2	1
5	3	6	2	4	1
3	5	6	2	4	1
3	2	5	4	6	1

5	3	6	2	4	1
3	5	2	6	1	4
3	2	5	1	6	4
2	3	1	5	4	6
2	1	3	4	5	6
1	2	4	3	6	5
2	3	4	5	6	1

A Plain Course of
DOUBLE BOB MINOR

Showing the Constructional
Shunts and the
Coursing Order.

Extreme Bells the first cycle will be completed, The bells will then be again in the Causing Order of the Principle, and if no more Hunts are made the bells will return to the Row from which they originally started as soon as the cycle of the Principle is completed, that is at the Lead End. But since, before that, another Hunt is made, the bells will not come home until the completion of both cycles coincides. See Diagram on page 154.

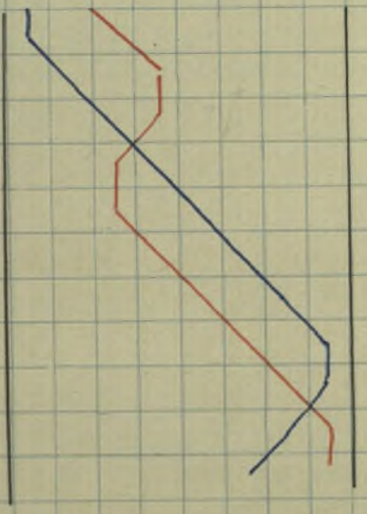
A Court Hunt is made in any change when the Hunt is neither Before nor Behind. At such a point the Extreme Bells are not all together as they are when an Extreme Hunt is made. Consequently, they cannot all at the same time make the one backward step. The Court Hunt is therefore made in two parts, one one side of the Hunts' path and one on the other.

When the Hunt is running up, all the Extreme Bells above it, make in

* Strictly speaking this is not Exactly true. In the Course of the Stunt each of the Extreme Bells makes one backward step relative to the Hunt. In the case of the dodging bells this backward step is made at the dodge. In the case of the place-making bell this backward step is made in two parts viz one half in the process of making each place. It will be observed that when a bell dodges the dodging bell is as it were delayed two rows in its running path, while to delay the place making bell two rows, would put it in the place of the Hunt, as might be anticipated from the consideration that the Court Stunt has the effect of interchanging in position the Hunt and the bell he goes it in Coursing order — E. S. POWELL.

any one Change, one backward step. Two Changes later all the Extreme Bells below the Hunt make one backward step *

	1	2	3	4	5	6	7	8	← C.O. = 53124687
	2	1	4	3	6	5	8	7	A1
	2	4	1	3	5	6	7	8	
	4	2	3	1	6	5	8	7	
A2	2	4	3	6	1	8	5	7	← C.O. = 51324687.
	4	2	6	3	8	1	7	5	

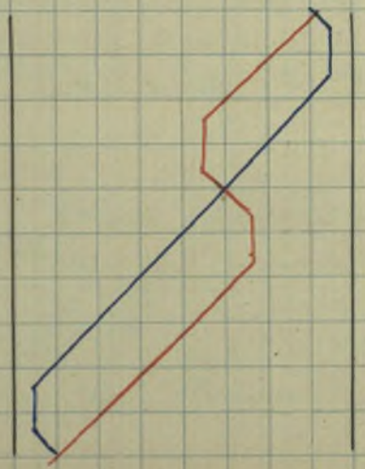


The result is that the Extreme Bells retain the same Coursing Order among themselves, but the bell that previously had Coursed immediately in front of the Hunt, now Courses immediately behind it. The Hunt and this bell have changed positions in Coursing Order, and the Hunt has made the first step

in its cyclical path.

When the Hunt is hunting down all the Extreme Bells below it, make, in any one Change, one backward step. Two Changes later all the Extreme Bells above the Hunt make one backward step.

8	7	6	5	4	3	2	1	← C.O. = 53124687.
7	8	5	6	3	4	1	2	
8	7	6	5	3	1	4	2	
7	8	5	6	1	3	2	4	
7	5	8	1	6	3	4	2	
5	7	1	8	3	6	2	4	← C.O. = 51324687.
5	1	7	3	8	2	6	4	



The result is exactly the same as in the last case (p. 156). The Hunt has changed positions in Running Order with the Bell next in front of it.

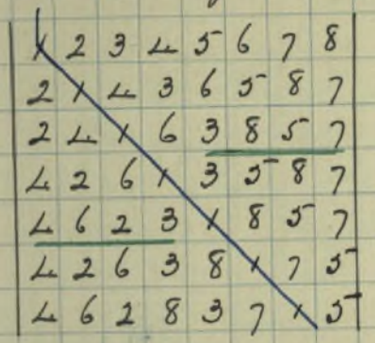
An R Court Shunt is a Court Shunt in which the number of Extreme Bells in both the part above, and the part below the Hunt, is odd, as in the last two examples.

The number of Places made is the same as in the Principle, and therefore the succession of the Nature of the Rows is the same as in the Principle.

A P Court Shunt is a Court Shunt in which the number of Extreme Bells in both the part above and the part below the Hunt is even.
In each part of the Shunt two more Places are made than in the Principle. Therefore the first part will alter the succession of the Nature of the Rows, and the second part will regain it.

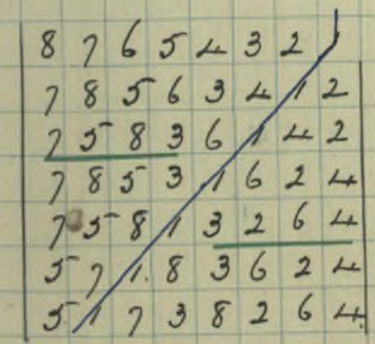
When the total number of Extreme Bells is even, one part of the Shunt will be R, and the other part P.
The P part will alter the succession of the Nature of the Rows.

Examples of P Conti Runs :-



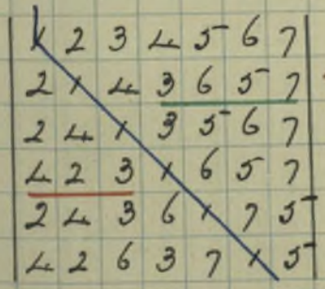
← C.O. = 53124687

← C.O. = 53124687



← C.O. = 53124687

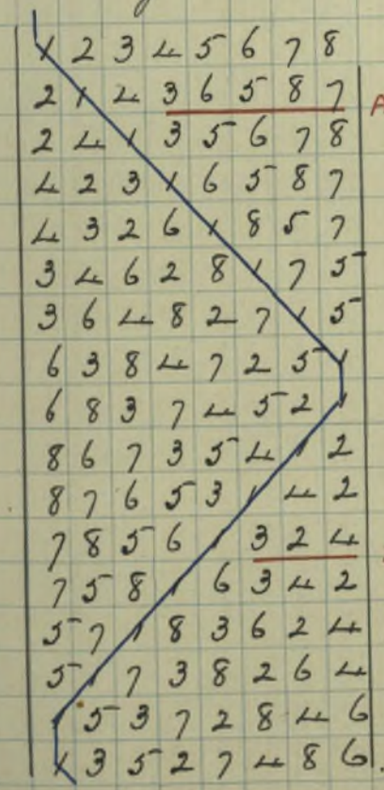
← C O = 53124687



← C.O. = 53124467

← C.O. = 53124467.

A Single R. Court Shunt, is a Court Shunt in which the first part is made, when the Shunt is Lunking up, on all the Extreme Bells above the Shunt, in any Change where the number of those bells is odd. The second part is made above the Shunt when the Shunt is Lunking down.



1 2 3 4 5 6 7 8

2 1 4 3 6 5 8 7 A1

2 4 1 3 5 6 7 8

4 2 3 1 6 5 8 7

4 3 2 6 1 8 5 7

3 4 6 2 8 1 7 5

3 6 4 8 2 7 1 5

6 3 8 4 7 2 5 1

6 8 3 7 4 5 2 1

8 6 7 3 5 4 1 2

8 7 6 5 3 1 4 2

7 8 5 6 1 3 2 4 A2.

7 5 8 1 6 3 4 2

5 7 1 8 3 6 2 4

5 1 7 3 8 2 6 4

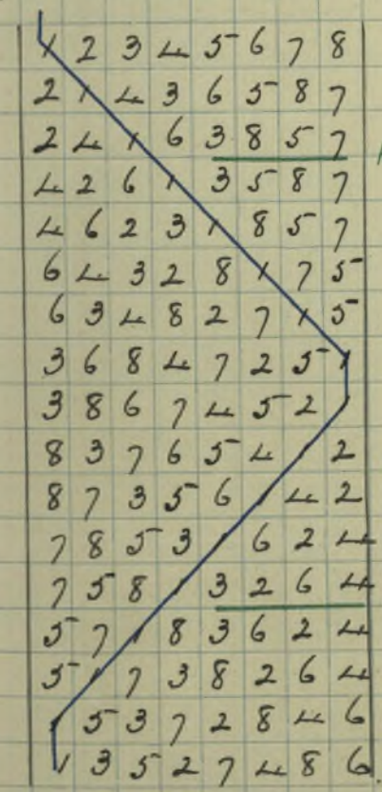
1 5 3 7 2 8 4 6

1 3 5 2 7 4 8 6.

1 - C.O. = 53124687

1 - C.O. = 513 24687.

A Single P Court Shunt is the same as a Single R Court Shunt, except that the number of Extreme Bells in both parts is even.



A1

← C.O. = 5312468 7

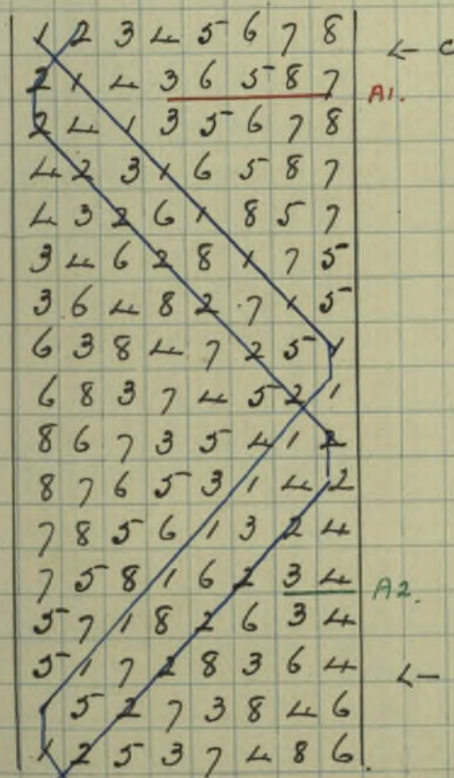
A2.

← C.O. = 5132468 7.

The Change, (with the Hunt Ranging down), in which the second part of a Single Court Shunt is made, corresponds with the Change, (with the Hunt Ranging up),

in which the second part of a Canti Shanti is made. The Rows are the same, but with the bells in reverse order.

The effect on the succession of the Notes of the Rows in the same in the Single Canti Shantis as in the Canti Shantis.



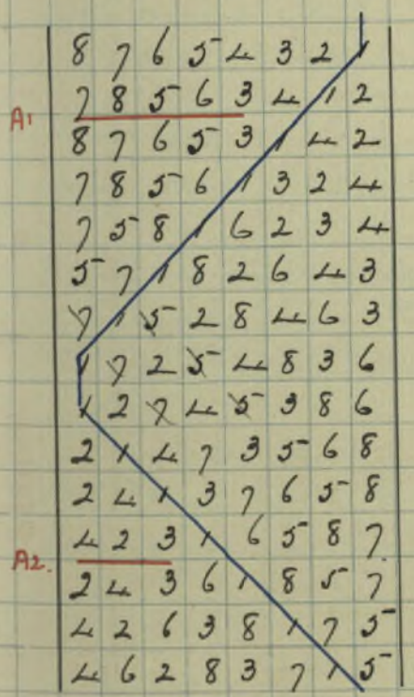
← C.O. = 5 3 1 2 4 6 8 7.

Where the Total number of Extreme Bells is even, Lay of the Shanti will be R. and part P.

← C.O. = 5 1 2 3 4 6 8 7

(S.S.P) 5 7

A Reverse Single Court Shuffle is the same as a Single Court Shuffle, except that both parts are made below the Hamlet path.



← C.O. = 5-3124687

← C.O. = 5-1324687

Reverse Single Court Shuffle divide into R and P, and the effect on the succession of the Nations of the Rows is the same as in other Court Shuffle.

Although the Extreme Shunts and the different varieties of Coutt Shunts, differ in the positions they are made, and so some extent in the way they are made, the effect is the same in each case — the Hunt has changed position in Coursing Order with the bell next before it, and made one step in its cyclical path.

In any Method on the Plain Principle on x Bells, there will be x Hunts and x-y Extreme Bells.

The number of positions in each lead in which Extreme and Coutt Shunts can be made is as follows. —

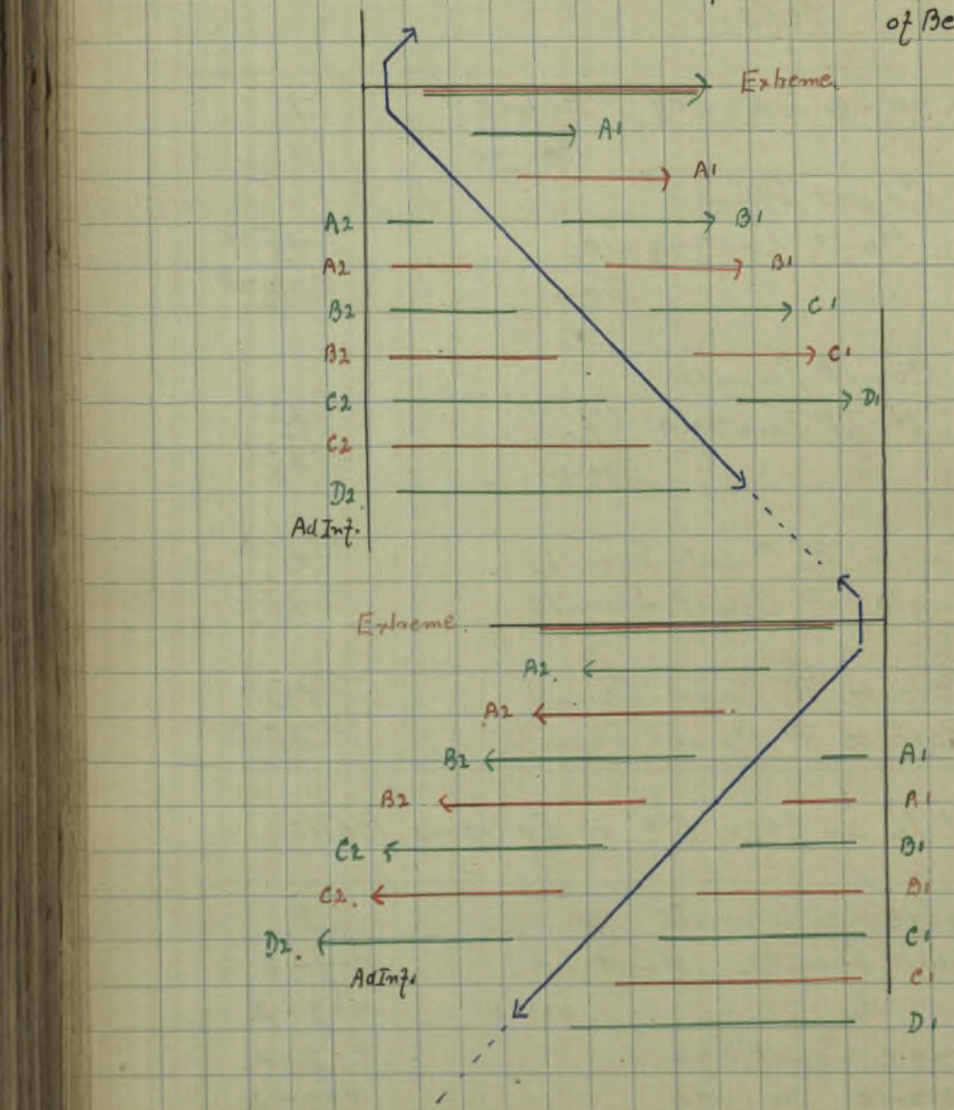
I. With an Odd Number of Extreme Bells.

Extreme Shunts. Before.	1.
Behind.	1.
R. Court Shunts.	
Hunt hunting Up.	$\frac{x-y-3}{2}$.
" " Down	$\frac{x-y-3}{2}$.
P. Court Shunts.	
Hunt hunting Up.	$\frac{x-y-1}{2}$.
" " Down	$\frac{x-y-1}{2}$.
Single R. Court Shunts.	$\frac{x-y-3}{2}$.
Single P Court Shunts.	$\frac{x-y-1}{2}$.
Reverse R. Court Shunts.	$\frac{x-y-3}{2}$
Reverse P Court Shunts.	$\frac{x-y-1}{2}$.

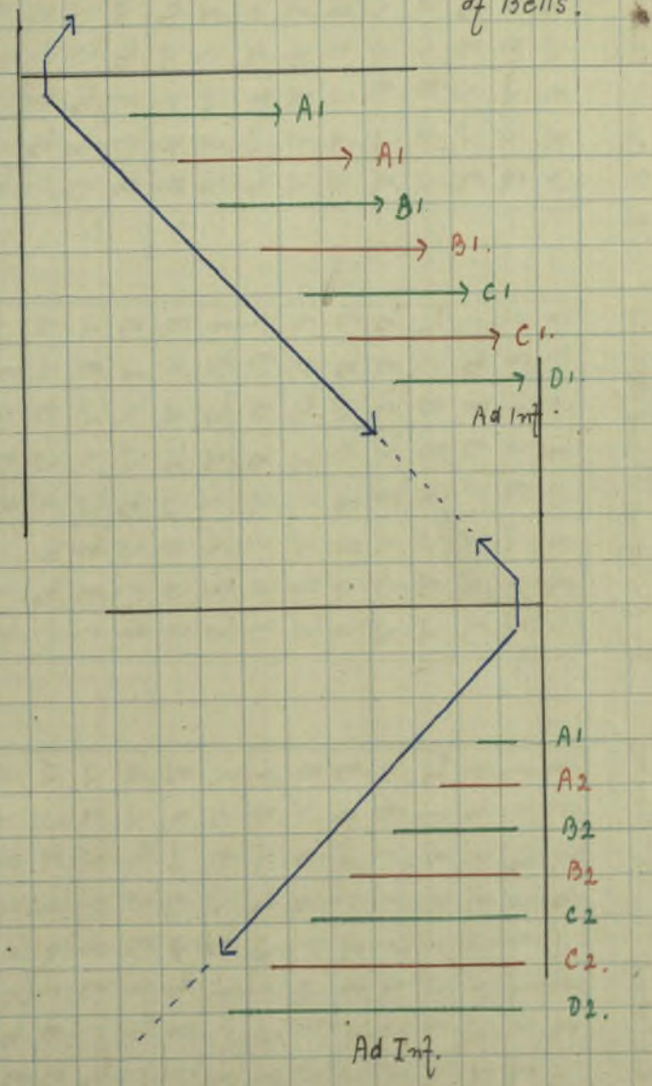
II With an Even No of Extreme Bells.

Extreme Shunts	2.
Court Shunts. Hunt up.	$x-y-2$.
do. " down	$x-y-2$.
Single Court Shunts.	$x-y-2$.
Reverse do do	$x-y-2$.

All. Possible Positions of Extreme and Court Shunts on Plain Principle on all numbers of Bells.

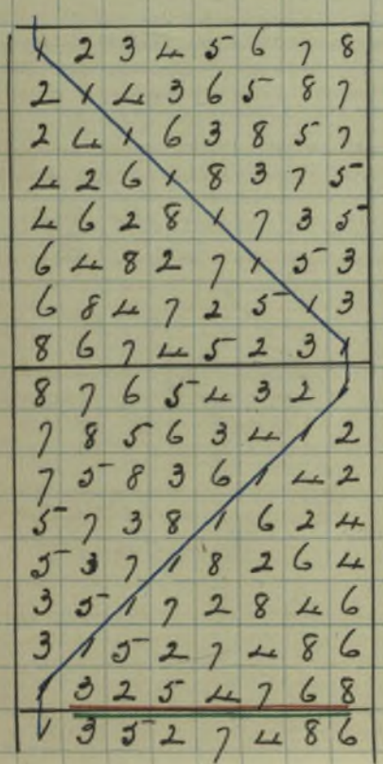


All. Possible Positions of Single Court Shunts on the Plain Principle on all numbers of Bells.

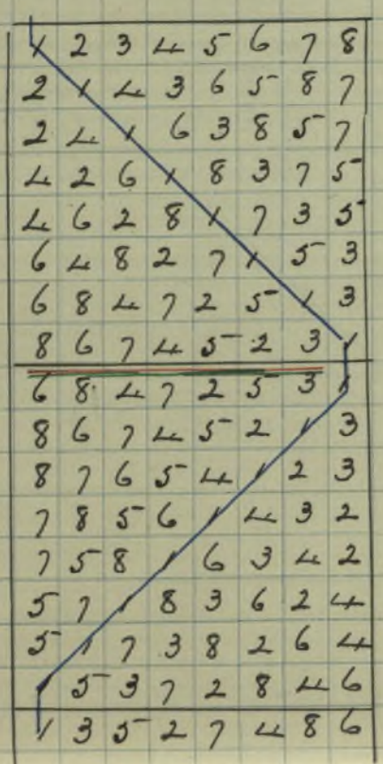


PLAIN. PRINCIPLE. 8 Bells. 1 Hunt. 4 Extreme Bells.

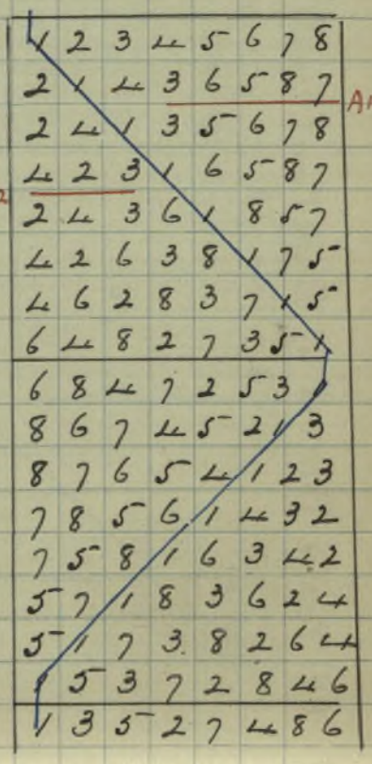
1. Extreme Shunl. Before.



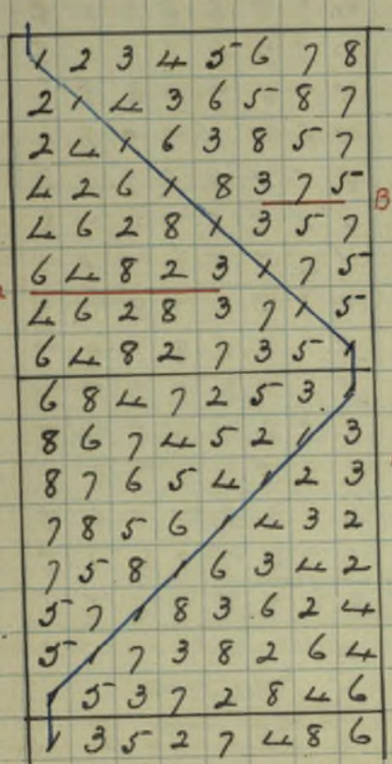
2. Extreme Shunl Behind



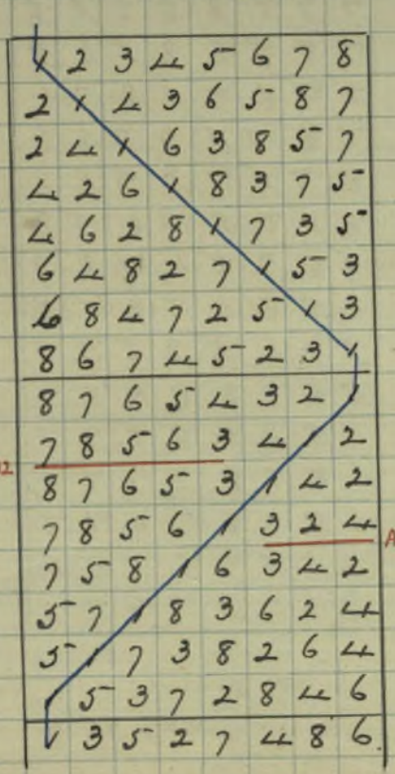
3. R. Courl. Shunl. Hunt up.



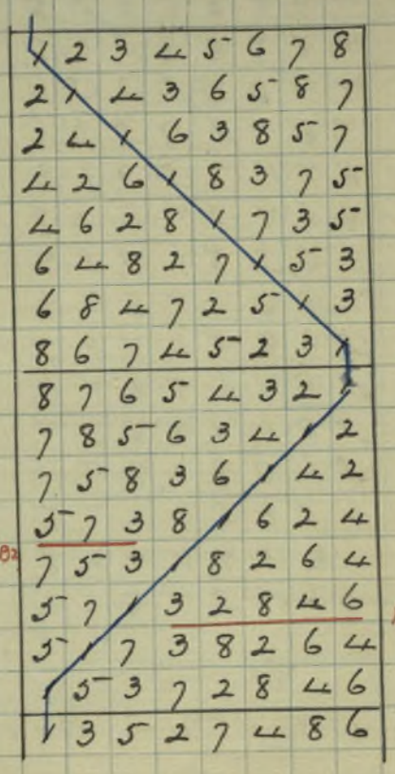
4. R Courl. Shunt. Hunl. up.



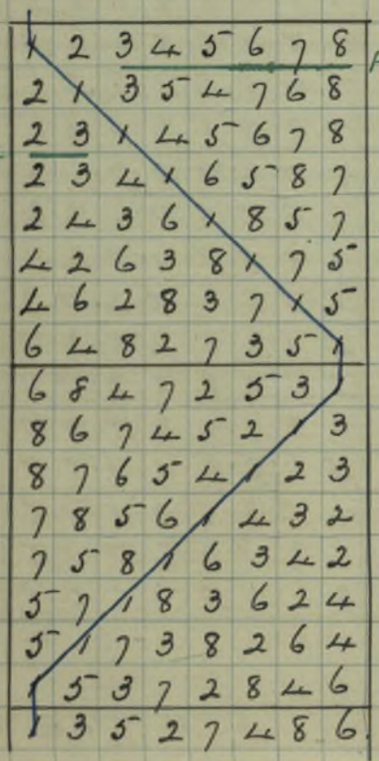
5. R Court Shunt Hunt Down.



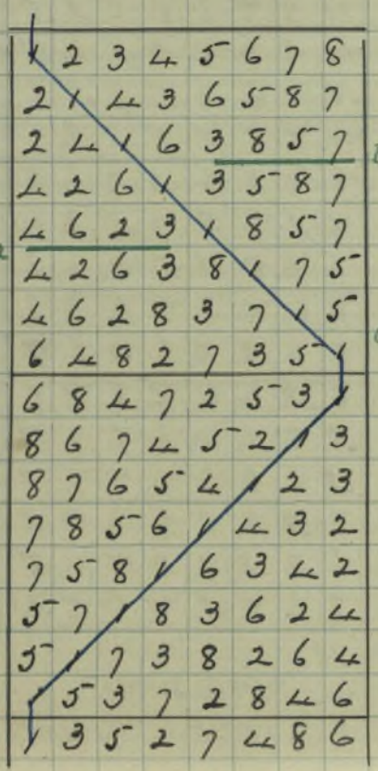
6. R. Courl Shunt Hunt Down.



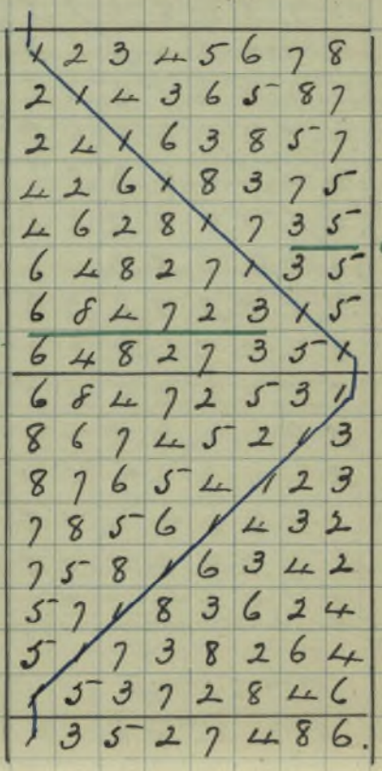
7. P Court Shunt.
Hunt Up.



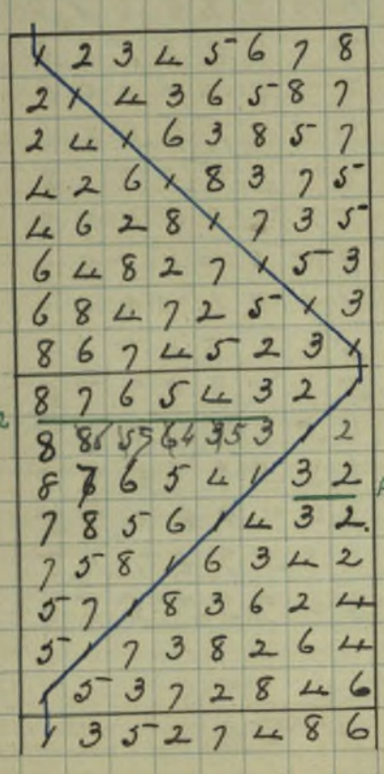
8. P Court Shunt
Hunt Up.



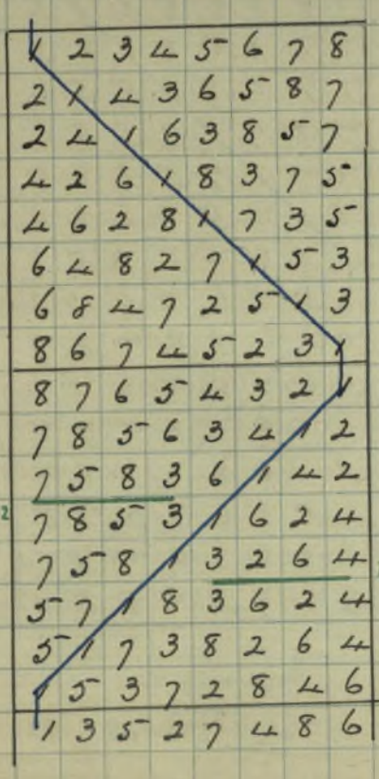
9. P Court Shunt
Hunt Up.



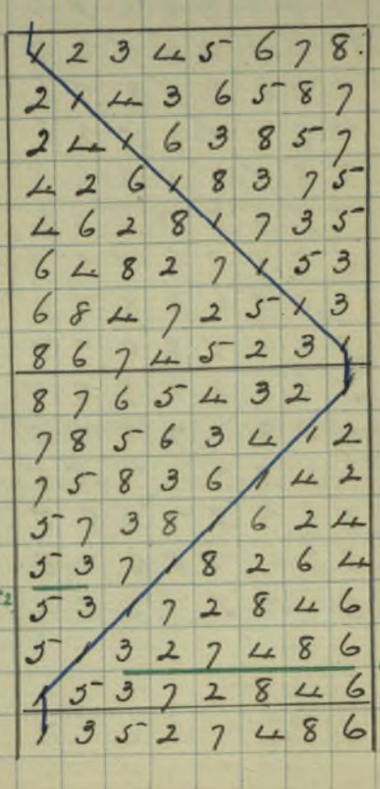
10. P Court Shunt
Hunt Down



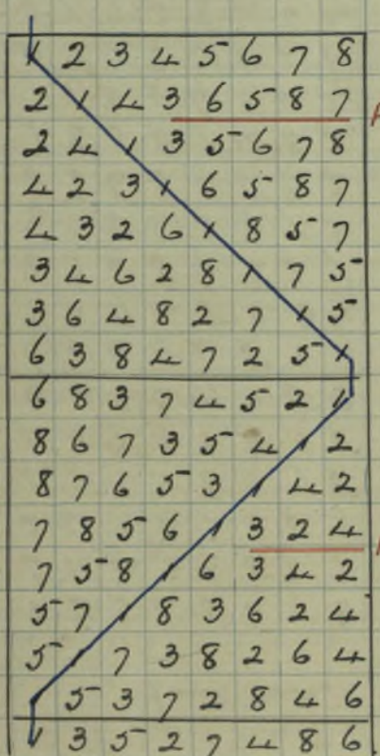
11. P Court Shunt
Hunt Down



12 P Court Shunt
Hunt Down.



13. R. Single Court Shunt.



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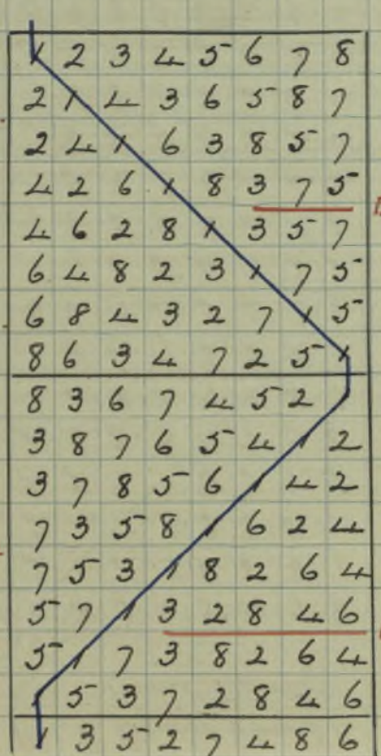
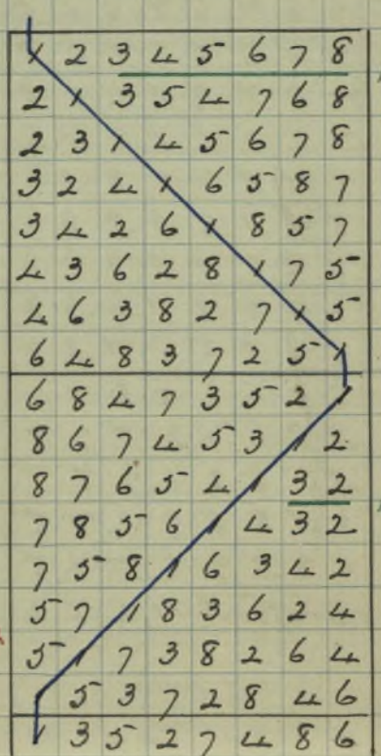
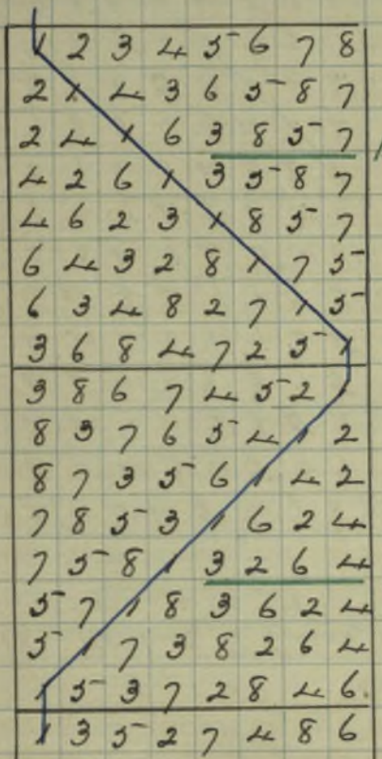


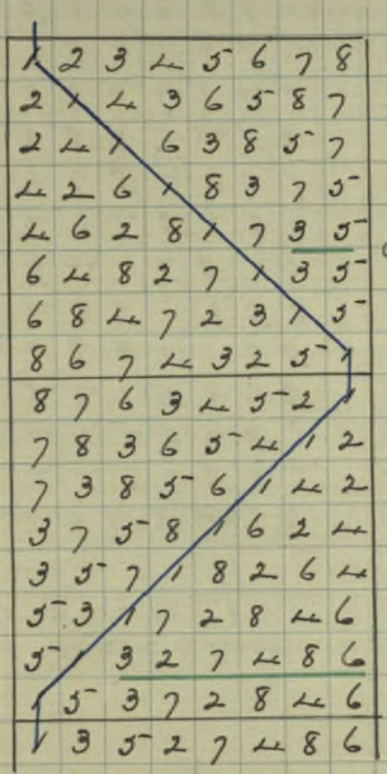
15. P. Single Court Shunt.



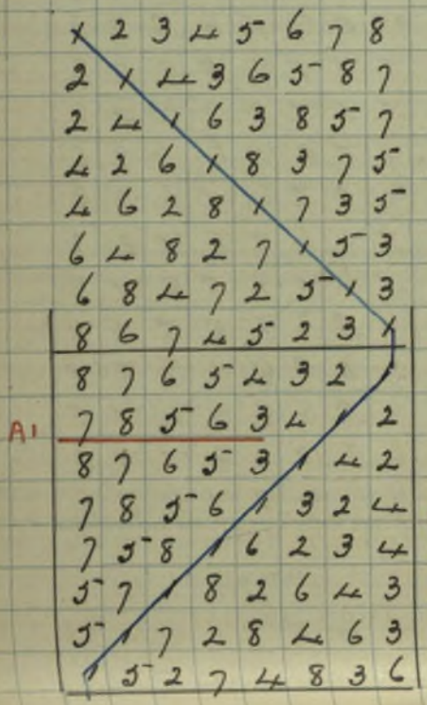
16. P. Single Court Shunt



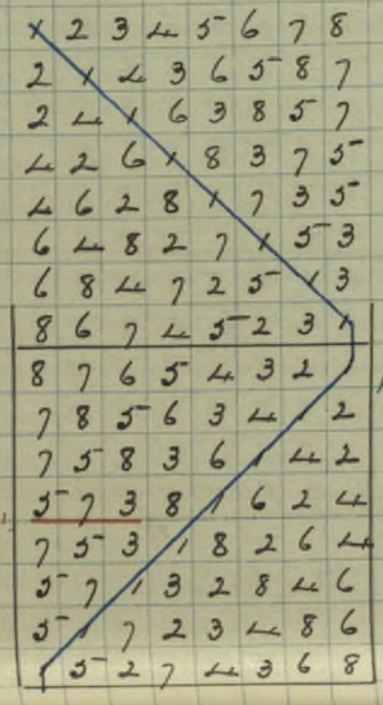
17. P. Single Court Shunt.



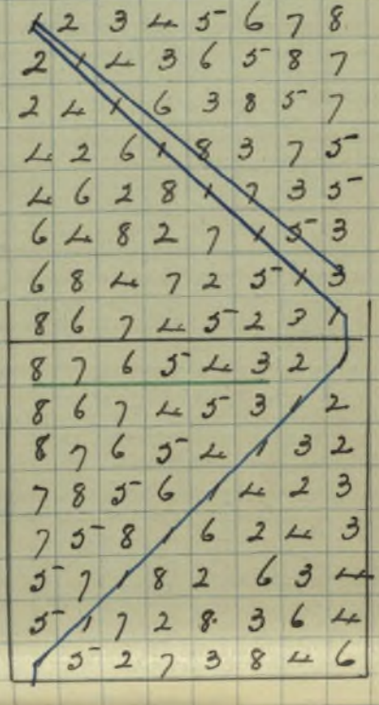
18. Reverse R. Single Court Shunt

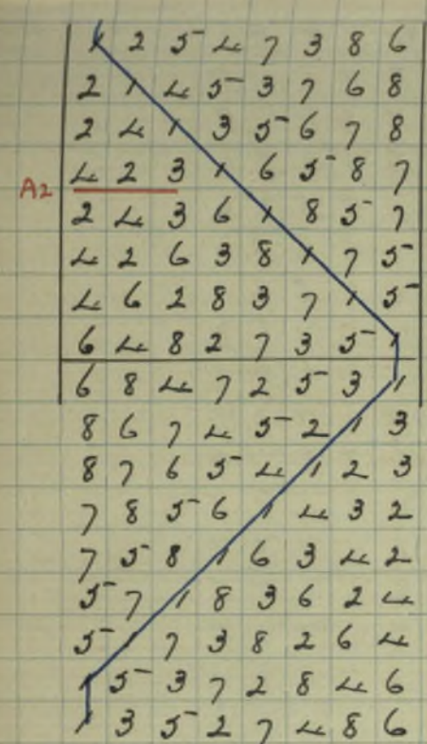


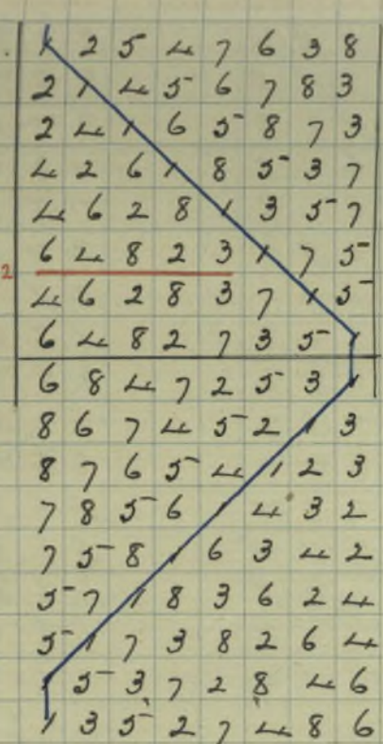
19 Reverse. R. Single Court Shunt.

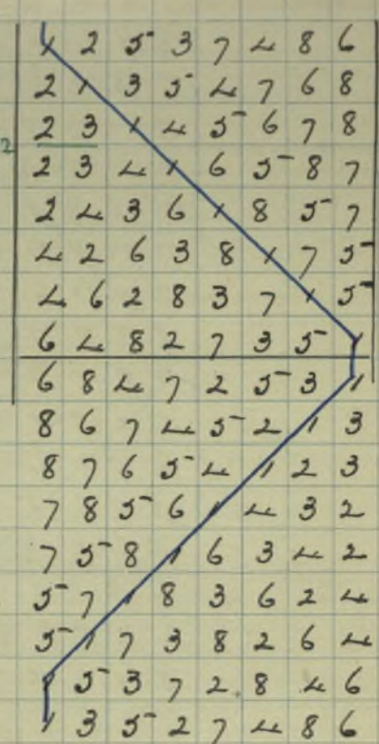


20. Reverse P. Single Court Shunt.

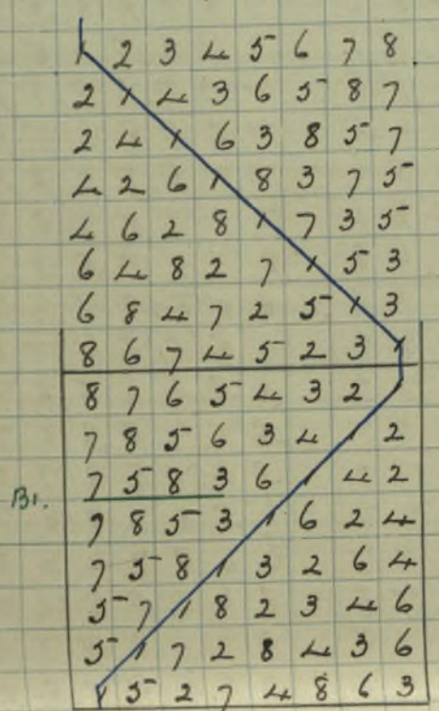






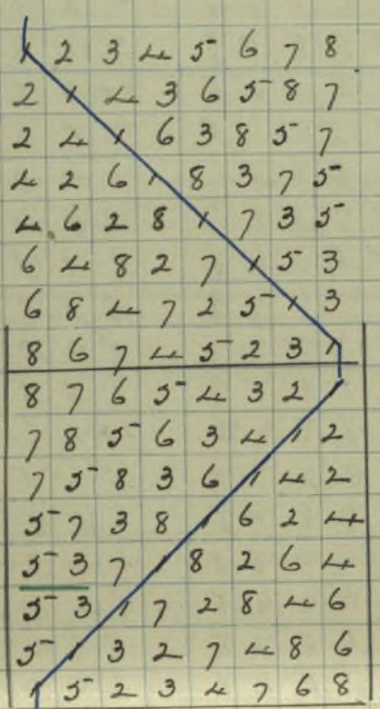


21. Reverse P. Single Court Shunt



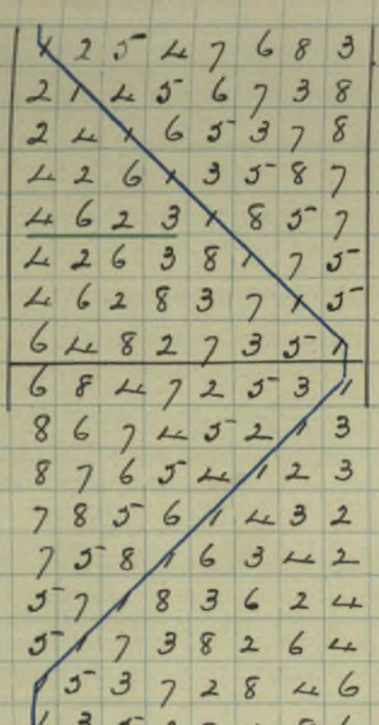
B1.

22. Reverse P. Single Court Shunt.

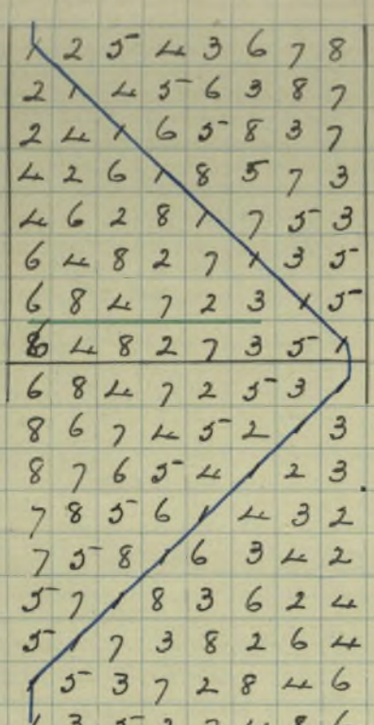


C1.

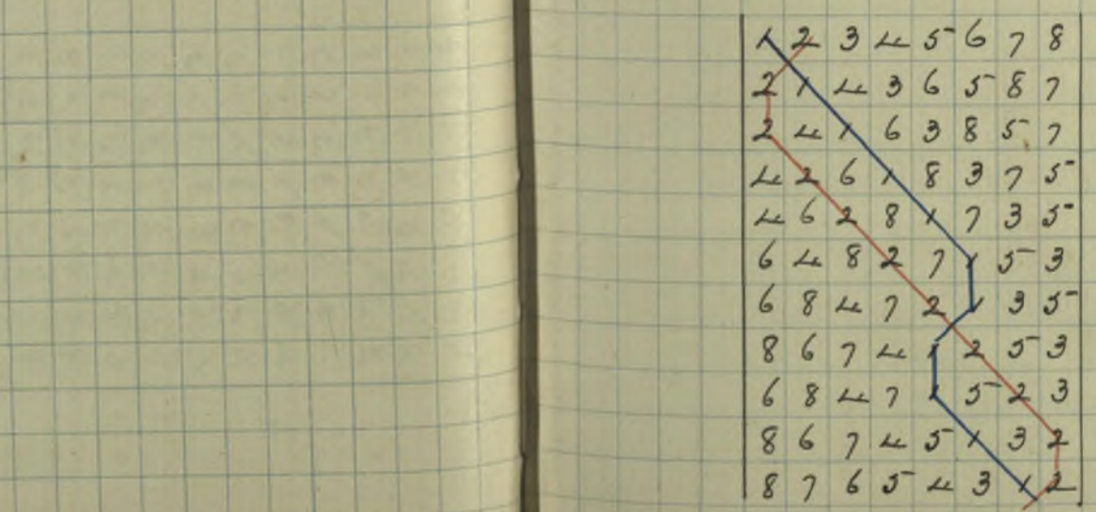
B2.



C2



The Slow Work Shunts. A Hunt can change positions in Coursing Order only with one of the two bells that is coursing immediately next it on either side. The Extreme Shunts and the different varieties of Coursi Shunts include all the positions in the Plain Principle in which the Hunt can change positions with the bell coursing in front of it. If the Hunt is to change positions with the bell coursing behind it, its movement must be retarded to allow that bell to pass it



← C.O. = 5 3 1 2 4 6 8 7.

← C.O = 5 3 2 1 4 6 8 7.

This however is not allowed by the conditions of the Group of Methods we are considering, in which the Hunt must have an uninterrupted plain hunting path.

Therefore, if the Hunt is engaged in no other movement than that of the Primary Principle, (and of course its cyclical path in Coursing Order), the Extreme Shunts and the Court Shunts are the only possible Constitutional Shunts.

But it is possible for the Hunt to be engaged as an Extreme Bell in secondary movements within the Lead, and yet retain its plain hunting path; and by means of those secondary movements to change positions with one or more Bells Coursing behind it. As a Hunt it can change positions with only one Extreme Bell at a time. As an Extreme Bell in a secondary movement, it must change positions with all the Hunts of that movement, whether they be one or more than one.

Fig M.

2	8	7	6	5	4	3	1
2	7	8	5	6	3	4	1
2	7	5	8	3	6	1	4
2	5	7	3	8	1	6	4
2	5	3	7	1	8	4	6
2	3	5	1	7	4	8	6
2	3	1	5	4	7	6	8
2	1	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
2	4	6	1	8	3	7	5
2	6	4	8	1	7	3	5
2	6	8	4	7	1	5	3
2	8	6	7	4	5	1	3
2	8	7	6	5	4	3	1

Fig. M. is a Course in which 2 is the Hunt, and 134678 are Extreme Bells (see page 119). The Extreme Bells keep the same Causing Order among themselves, but the Hunt changes positions with each in due order.

If 2 omitted to change positions in Causing Order with any one of the Extreme Bells, the result would be that at the end of the Course those two bells would be transposed in Causing Order; and also that the Extreme Bells would plain Hunt from back to front.

If the Course is continuously repeated and this particular Extreme Bell omits to change positions in Causing Order with the Hunt of each of the repetitions, it will take a continuous

repeated plain hunting path and become the Hunting a fresh Course. Each Step of its Cyclical path in Causing Order will Consist of the omission to make, as an Extreme Bell, the Step in the smaller Course.

	1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7	
2	4	1	6	3	8	5	7	
2	4	6	1	8	3	7	5	
2	6	4	8	1	7	3	5	
2	6	8	4	7	1	5	3	
2	8	6	7	4	5	1	3	
2	8	7	6	5	4	3	1	
2	7	8	5	6	3	4		
2	7	5	8	3	6		4	
2	5	7	3	8		6	4	
2	5	3	7		8	4	6	
2	3	5		7	4	8	6	
2	3		5	4	7	6	8	
2		3	4	5	6	7	8	
	2	4	3	6	5	8	7	
1	4	2	6	3	8	5	7	
4	1	6	2	8	3	7	5	
4	6	1	8	2	7	3	5	

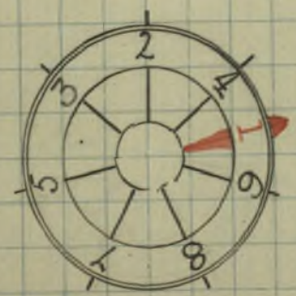
← C.O. = 53124687.

← C.O = 53214687.

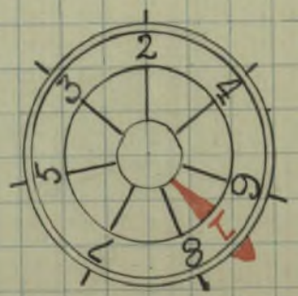
ONE-BELL SLOW WORK SHUNT PLAIN PRINCIPLE.

		COURSING ORDER SMALL CYCLE	MAIN CYCLE
1 2 3 4 5 6 7 8	←		12468753
2 1 4 3 6 5 8 7	←	24687531	
2 4 1 6 3 8 5 7			
2 4 6 1 8 3 7 5	←	42687531	
2 6 4 8 1 7 3 5			
2 6 8 4 7 1 5 3	←	46287531	
2 8 6 7 4 5 1 3			
2 8 7 6 5 4 3 1	←	46827531	
2 7 8 5 6 3 4 1			
2 7 5 8 3 6 1 4	←	46872531	
2 5 7 3 8 1 6 4			
2 5 3 7 1 8 4 6	←	46875231	
2 3 5 1 7 4 8 6			
2 3 1 5 4 7 6 8	←	46875321	
2 1 3 4 5 6 7 8	←		21468753
1 2 4 3 6 5 8 7			

1 4 2 6 3 8 5 7	←	21468753
4 1 6 2 8 3 7 5	← 46875321	
4 6 1 8 2 7 3 5		
4 6 8 1 7 2 5 3	← 64875321	
4 8 6 7 1 5 2 3		
4 8 7 6 5 1 3 2	← 68475321	
4 7 8 5 6 3 1 2		
4 7 5 8 3 6 2 1	← 68745321	
4 5 7 3 8 2 6 1		
4 5 3 7 2 8 1 6	← 68754321	
4 3 5 2 7 1 8 6		
4 3 2 5 1 7 6 8	← 68753421	
4 2 3 1 5 6 7 8		
4 2 1 3 6 5 8 7	← 68753241	
4 1 2 6 3 8 5 7	←	24168753
1 4 6 2 8 3 7 5		



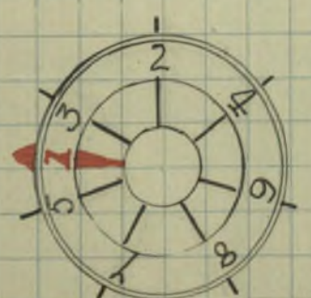
6	6	4	8	2	7	3	5	← 24168753
6	8	4	7	2	5	3	1	← 687532 41
6	8	7	4	5	2	3	1	
6	8	7	1	5	4	3	2	← 867532 41
6	7	8	5	1	3	4	2	
6	7	5	8	3	1	2	4	← 876532 41
6	5	7	3	8	2	1	4	
6	5	3	7	2	8	4	1	← 875632 41
6	3	5	2	7	4	8	1	
6	3	2	5	4	7	1	8	← 875362 41
6	2	3	4	5	1	7	8	
6	2	4	3	1	5	8	7	← 875326 41
6	4	2	1	3	8	5	7	
6	4	1	2	8	3	7	5	← 875324 61
6	1	4	8	2	7	3	5	← 24618753
1	6	8	4	7	2	5	3	



8	8	6	7	4	5	2	3	← 246.18753
8	1	7	6	5	4	3	2	← 875324 61
8	7	1	5	6	3	4	2	
8	7	5	1	3	6	2	4	← 785324 61
8	5	7	3	1	2	6	4	
8	5	3	7	2	1	4	6	← 758324 61
8	3	5	2	7	4	1	6	
8	3	2	5	4	7	6	1	← 753824 61
8	2	3	4	5	6	7	1	
8	2	4	3	6	5	1	7	← 753284 61
8	4	2	6	3	1	5	7	
8	4	6	2	1	3	7	5	← 753248 61
8	6	4	1	2	7	3	5	
8	6	1	4	7	2	5	3	← 753246 81
8	1	6	7	4	5	2	3	← 24681753
1	8	7	6	5	4	3	2	

↘	7	8	5̄	6	3	4	2	← 24681753
7	↘	5̄	8	3	6	2	4	← 75324681
7	5̄	↘	3	8	2	6	4	
7	5̄	3	↘	2	8	4	6	← 57324681
7	3	5̄	2	↘	4	8	6	
7	3	2	5̄	4	↘	6	8	← 53724681
7	2	3	4	5̄	6	↘	8	
7	2	4	3	6	5̄	8	↘	← 53274681
7	4	2	6	3	8	5̄		
7	4	6	2	8	3	↘	5̄	← 53247681
7	6	4	8	2	↘	3	5̄	
7	6	8	4	↘	2	5̄	3	← 53246781
7	8	6	↘	4	5̄	2	3	
7	8	↘	6	5̄	4	3	2	← 53246871
7	↘	8	5̄	6	3	4	2	← 24687153.
↘	7	5̄	8	3	6	2	4	

↘	5̄	7	3	8	2	6	4	← 24687153.
5̄	↘	3	7	2	8	4	6	← 53246871.
5̄	3	↘	2	7	4	8	6	
5̄	3	2	↘	4	7	6	8	← 35246871
5̄	2	3	4	↘	6	7	8	
5̄	2	4	3	6	↘	8	7	← 32546871
5̄	4	2	6	3	8	↘	7	
5̄	4	6	2	8	3	7	↘	← 32456871
5̄	6	4	8	2	7	3		
5̄	6	8	4	7	2	↘	3	← 32465871
5̄	8	6	7	4	↘	2	3	
5̄	8	7	6	↘	4	3	2	← 32468571
5̄	7	8	↘	6	3	4	2	
5̄	7	↘	8	3	6	2	4	← 32468751.
5̄	↘	7	3	8	2	6	4	← 24687513.
↘	5̄	3	7	2	8	4	6	



1	3	5	2	7	4	8	6	←	24687513
3	1	2	5	4	7	6	8	←	32468751
3	2	1	4	5	6	7	8		
3	2	4	1	6	5	8	7	←	23468751
3	4	2	6	1	8	5	7		
3	4	6	2	8	1	7	5	←	24368751
3	6	4	8	2	7	1	5		
3	6	8	4	7	2	5	1	←	24638751
3	8	6	7	4	5	2			
3	8	7	6	5	4	1	2	←	24683751
3	7	8	5	6	1	4	2		
3	7	5	8	1	6	2	4	←	24687351
3	5	7	1	8	2	6	4		
3	5	1	7	2	8	4	6	←	24687531
3	1	5	2	7	4	8	6	←	24687531
1	3	2	5	4	7	6	8		
1	2	3	4	5	6	7	8		

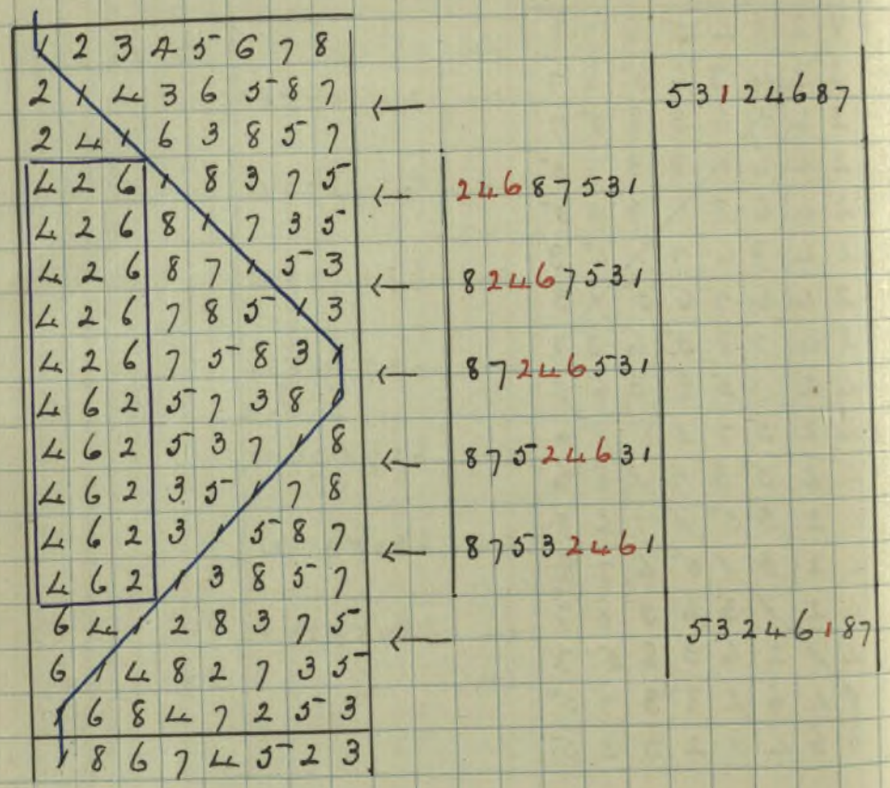
TWO BELL SLOW WORK SHUNT

1	2	3	4	5	6	7	8	←	53124687
2	1	4	3	6	5	8	7	←	24687531
2	4	1	6	3	8	5	7		
2	4	6	1	8	3	7	5	←	62487531
2	4	6	8	1	7	3	5		
2	4	8	6	7	1	5	3	←	68247531
2	4	8	7	6	5	1	3		
2	4	7	8	5	6	3	1	←	68724531
4	2	7	5	8	3	6	1		
4	2	5	7	3	8	1	6	←	68752431
4	2	5	3	7	1	8	6		
4	2	3	5	1	7	6	8	←	68753241
4	2	3	1	5	6	7	8		
4	2	1	3	6	5	8	7	←	68753241
4	1	2	6	3	8	5	7	←	53241687
1	4	6	2	8	3	7	5		
1	6	4	8	2	7	3	5		

COURSING ORDER.

		1 2 4 6 8 7 5 3
1st.	Lead End.	2 4 1 6 8 7 5 3
2nd.	do	2 4 6 8 1 7 5 3
3rd.	do	2 4 6 8 7 5 1 3
4th	do	2 1 4 6 8 7 5 3
5th	do	2 4 6 1 8 7 5 3
6th	do	2 4 6 8 7 1 5 3
7th	do	1 2 4 6 8 7 5 3

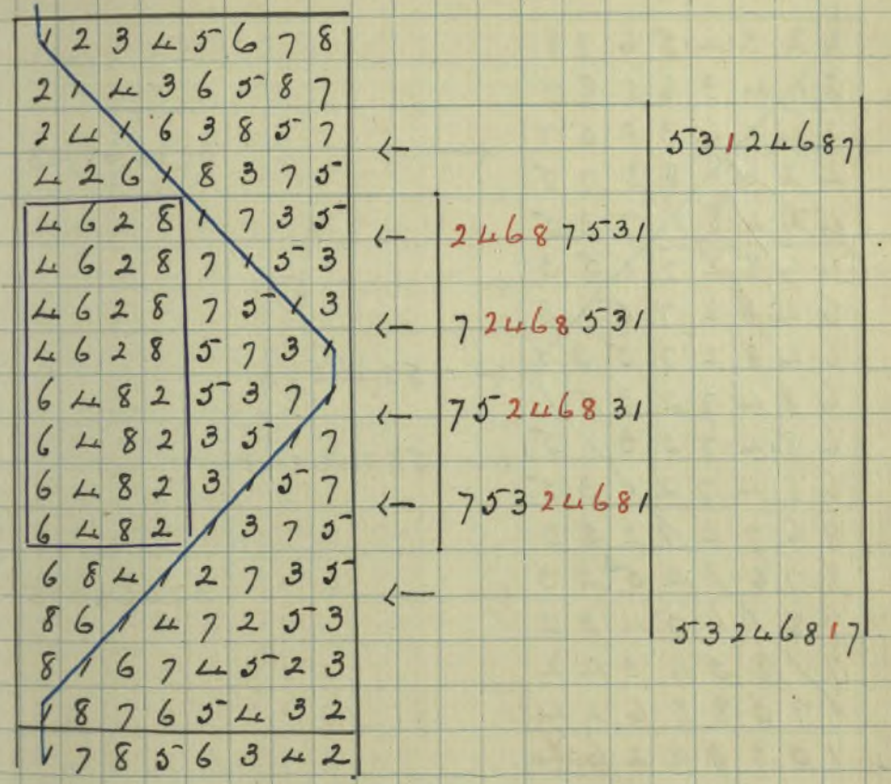
THREE BELL SLOW WORK SHUNT



COURSING ORDER.

1st Lead End.	1 2 4 6 8 7 5 3 .
2nd do	2 4 6 1 8 7 5 3
3rd. do	2 4 6 8 7 5 1 3
4th do	2 4 1 6 8 7 5 3
5th do	2 4 6 8 7 1 5 3
6th. do	2 1 4 6 8 7 5 3
7th do	2 4 6 8 1 7 5 3
	1 2 4 6 8 7 5 3.

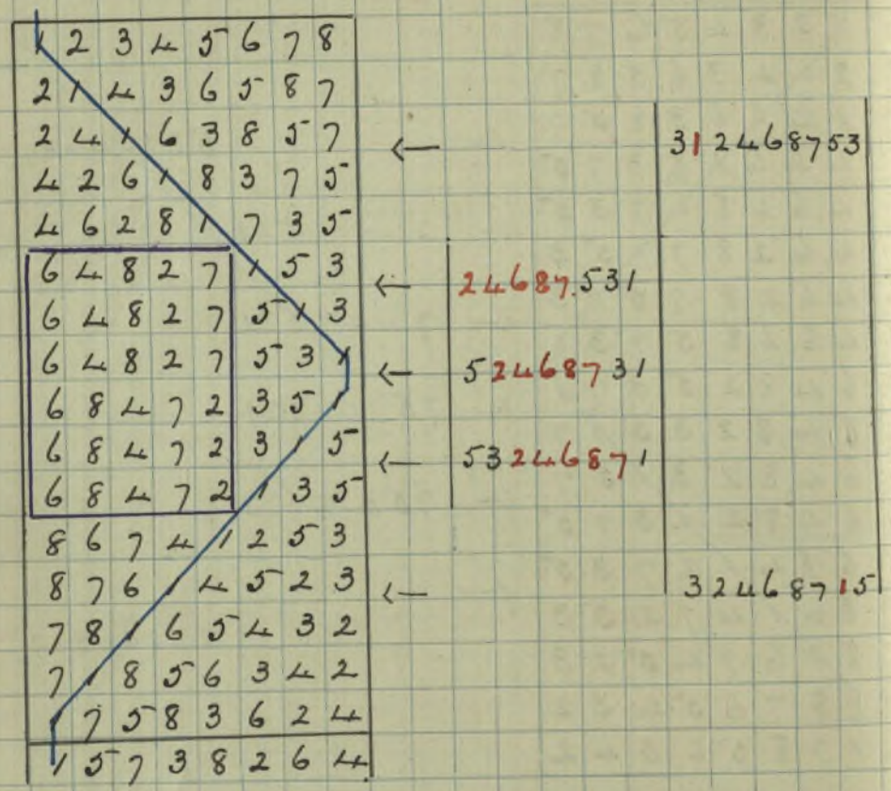
FOUR BELL SLOW WORK SHUNT



COURSING ORDER.

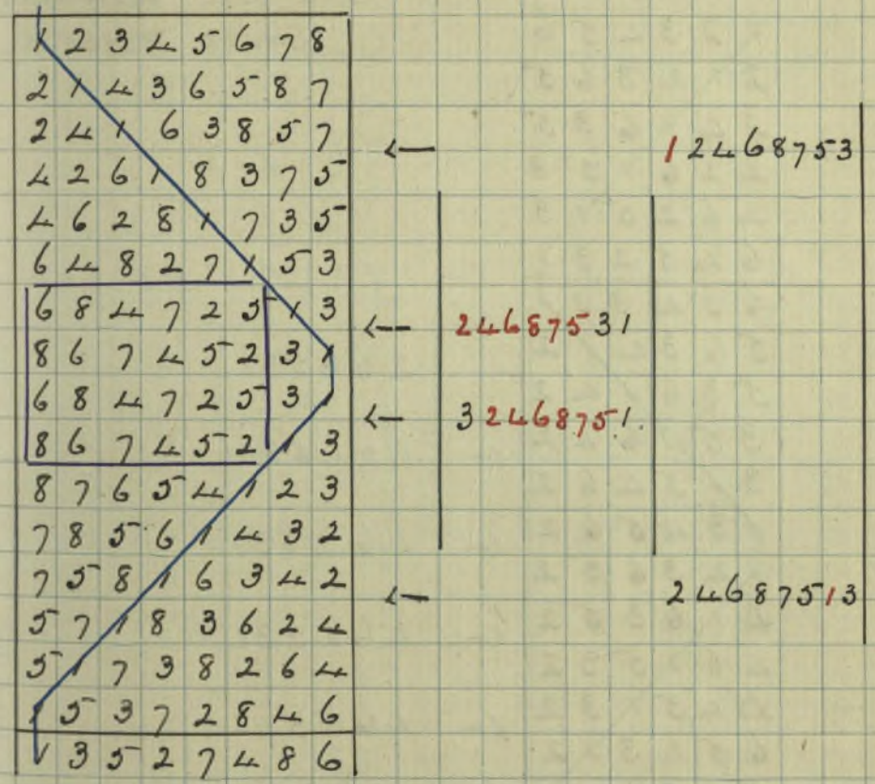
1st Lead End.	1 2 4 6 8 7 5 3
2nd do	2 4 6 8 1 7 5 3
3rd do	2 1 4 6 8 7 5 3
4th do	2 4 6 8 7 1 5 3
5th do	2 4 1 6 8 7 5 3
6th do	2 4 6 8 7 5 1 3
7th do	2 4 6 1 8 7 5 3
	1 2 4 6 8 7 5 3

FIVE BELL SLOW WORK SHUNT.



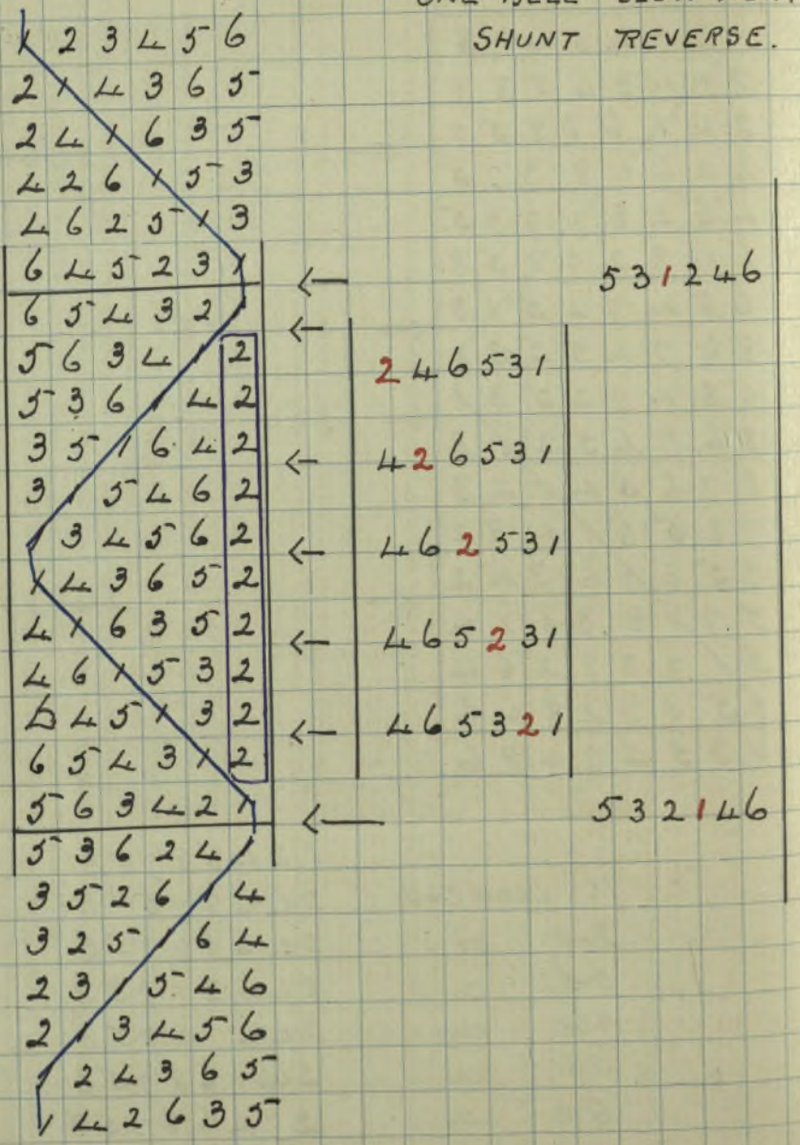
1st Lead End		1 2 4 6 8 7 5 3
2nd	do	2 4 6 8 7 1 5 3
3rd	do	2 4 6 1 8 7 5 3
4th	do	2 4 6 8 7 5 1 3
5th	do	2 4 6 8 1 7 5 3
6th	do	2 4 1 6 8 7 5 3
7th	do	1 2 4 6 8 7 5 3

SIX BELL SLOW WORK SHUNT

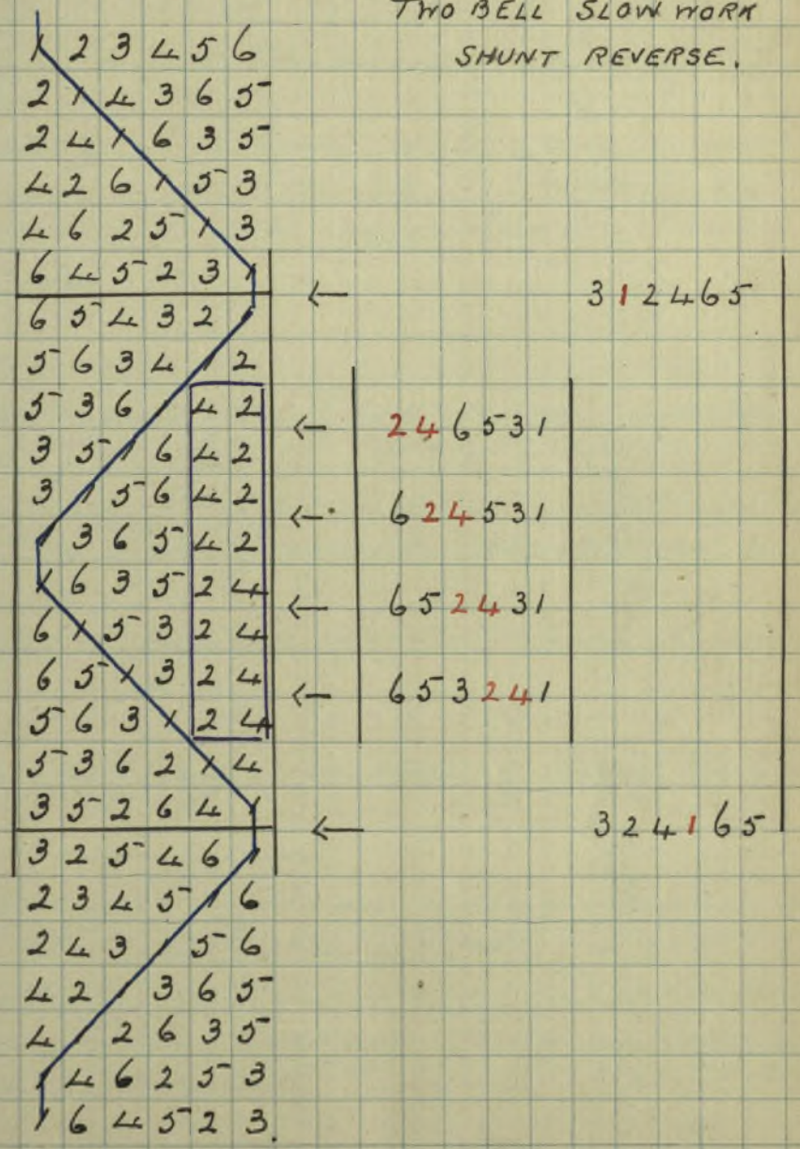


		1 2 4 6 8 7 5 3
1st Lead End.		2 4 6 8 7 5 1 3
2nd	do	2 4 6 8 7 1 5 3
3rd.	do	2 4 6 8 1 7 5 3
4th	do	2 4 6 1 8 7 5 3
5th	do	2 4 1 6 8 7 5 3
6th	do	2 1 4 6 8 7 5 3
7th.	do	1 2 4 6 8 7 5 3

ONE BELL SLOW WORK SHUNT REVERSE.



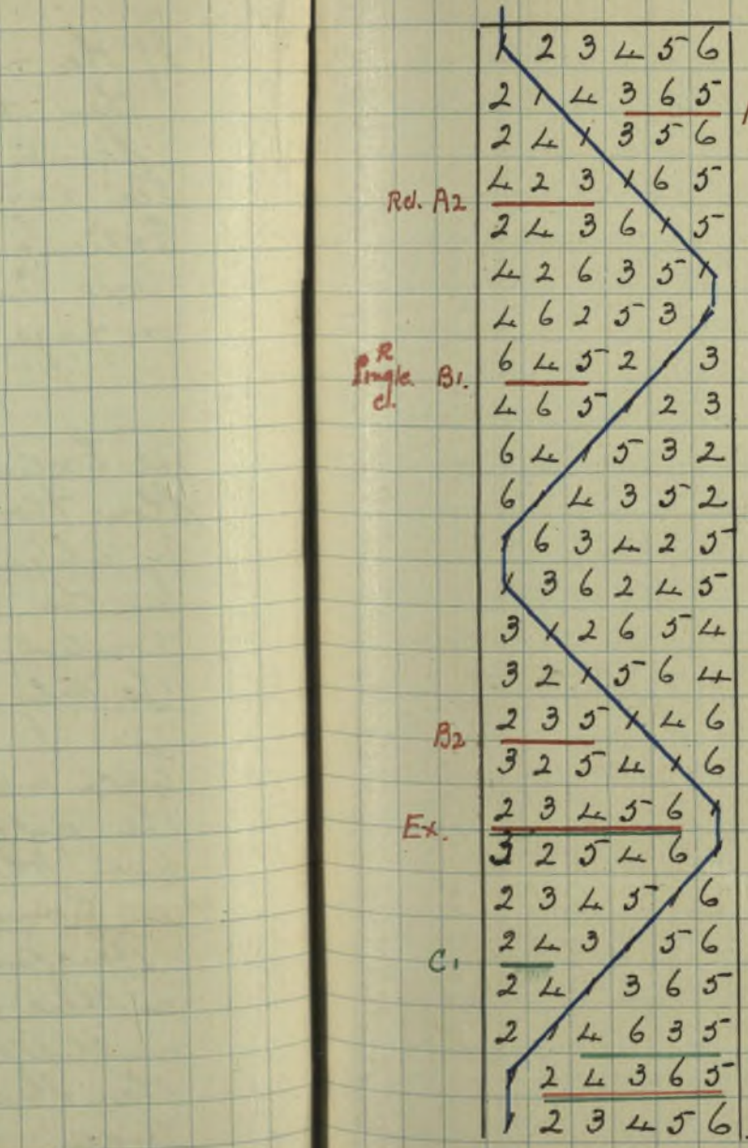
TWO BELL SLOW WORK SHUNT REVERSE.



If the number of Exclieme Bells = x-y.
Then the possible number of Slow Work
Shunts = x-y-1.
The x-y-1 Bell Shunt is the same as an
Exclieme. See Example (6-Bell Slow
Work Shunt with seven Exclieme Bells)
on page. 181.

The Exclieues, the Count Shunts, and the
Slow Work Shunts are the only means
by which the Hunts in any Method
on the Plain Principle can change its
position in Coursing Order. They are
the only possible Constructional Shunts.

Each one of the Exclieme Shunts, or of
the different varieties of Count Shunts,
puts the Hunt one position forward
in Coursing Order.
Therefore as many of these Shunts
as there are Exclieme Bells, or any
multiple of that number, will complete
the Hunts cyclical path in Coursing
Order, and will bring the bells
back to the Row from which they
originally started. This will be



entirely irrespective of whether the Shunts are arranged in any symmetrical order or no; or whether the Block is divided into equal Leads or no.

See Example in which there are five Exclieme Bells and the following Shunts

Exclliemes = 2
R. Court Shunts = 1.
P. Court Shunts = 1.
Reverse Single Court Shunts = 1.
Total. 5

But in any Method that Conforms to the Conditions generally required by the Exercise, it is necessary that they should be

arranged so that (1) every Lead is alike and (2) that each Lead should be symmetrical about a line drawn through the Hunt's Whole pull behind when there is one Hunt; or midway between the Hunts' Whole pulls behind when there are five Hunts.

On page 321-9 I give a formula which gives all possible arrangements of these Hunts on all numbers of Bells under these conditions.

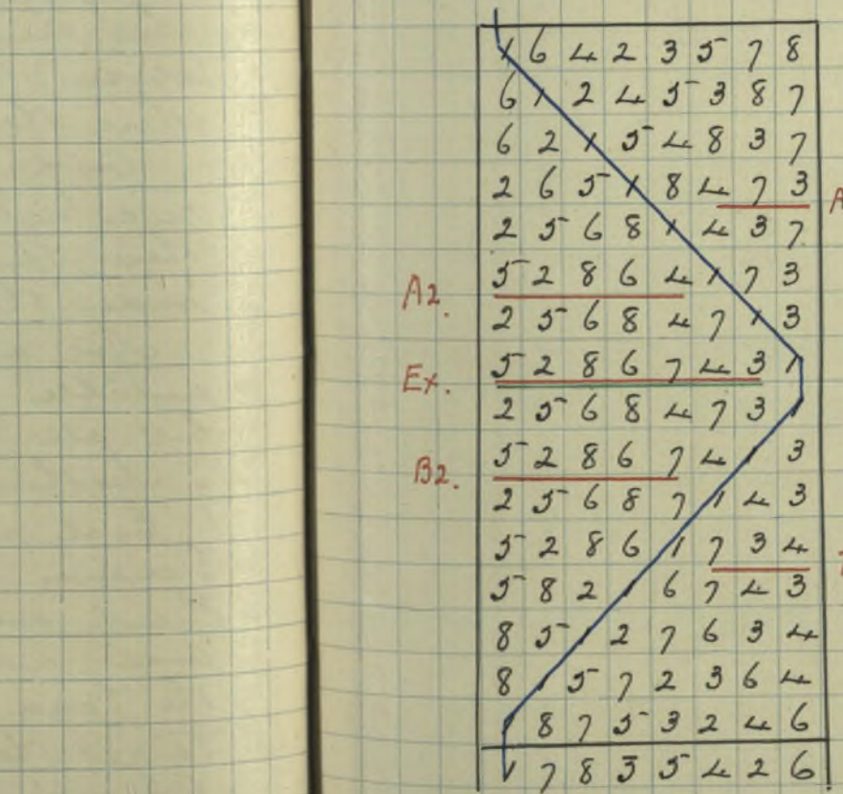
Not all these arrangements are suitable for use as practical Methods, but all can be used as the foundations of Methods.

Each single one of these Hunts — Extreme or Coast Hunts — puts the Hunt one position forward in Causing Order and therefore each will produce the Lead End 135274286----

To get the Lead End when there are five or more Hunts in the Lead, transpose the preceding Lead End by 135274286---- as many times as there are Hunts.

Thus if a Lead containing five Coast Hunts and one Extreme, follow

16 4 2 3 5 7 8 The Lead End produced will be 64235 78 ∴ (3527486)² = 7835426.



← C.O. = 41625873.

← C.O. = 14628753

← C.O. = 46287513

← C.O. = 46287

A Slow Work Plain puts the Plain backward in Coursing Order as many positions as there are Bells in the Plain. Therefore a 7 Bell Slow Work Plain will

produce from rounds the Lead End
14263857 - - -

To find the Lead End produced by any Slow Work Stunt, transpose the preceding Lead End by 14263857 - - as many times as there are bells in the Stunt

Thus from the Lead End 16423578 a 3-Bell Slow Work Stunt will give the following Lead End $6423578 \times (4263857)^3 = 8572364$.

As the movement of an Exclusive or a Canti stunt is + and the movement of a Slow Work Stunt is −, in any Block containing these Stunts mixed, the bells will come round when the sum of the Stunts = 0 or any multiple of the number of Exclusive Bells. This will happen quite irrespective of whether the Stunts are arranged symmetrically, or whether the Block is divided into similar Leads.

Thus, with seven Exclusive Bells, 3 Exclusive Stunts, 10 Canti Stunts, 1 4-Bell Slow Work Stunt and 1 2-Bell Slow Work Stunt (3+10−4−2) will bring

the bells back to the Row from which they originally started.

To comply with the accepted standards of symmetry, only one kind of Slow Work Stunt can be used in any one Method.

Slow Work Stunts in their natural form, are not suitable for use in Methods for practical ringing; but by means of Additional Stunts their disadvantages can be removed, while at the same time their constructional work and value are fully retained.

On page 321. I give a formula which will produce every possible Slow Work Stunt on all numbers and also on page 329, a formula giving all the combinations of Extreme Court Stunts and Slow Work Stunts.

For purely practical purposes Reverse Court Stunts and Reverse Slow Bell Stunts are of little value.

Chapter IX

Methods which are founded on Hunts and Extreme Bells. (continued)

Additional Shunts.

Additional Shunts are cyclical movements made by two or more of the Extreme Bells of the main movement of the Constructional Shunts, the number of bells involved being less than the total number of Extreme Bells.

They do not differ in nature from the Constructional Shunts. By the nature of cyclical movement they must consist of Hunts and Extreme Bells, with the three characteristic cyclical movements. If it is convenient to speak of them as either Hunting Causes or Dodging Movements on certain bells, and so leave the Hunts and their cyclical path in Causing Order to be implied.

Constructional Shunts settle the main

Construction of the Course, the length of the Course, the number of the Leads, and the Natural Lead Ends.

Additional Shunts do not affect these things. Their uses are to introduce fresh work into the Method, to remove blemishes left by the Constructional Shunts, and in the case of the Treble Bob and other Principles, to counteract the natural falseness of those Principles.

Additional Shunts fall into two groups -

(a) Those which are wholly made within one Lead, and

(b) Those whose operation Extends to five or more Leads.

Methods which have the second kind of Additional Shunt are not, now adays, considered to reach the standard required for practical ringing.

Fig. M.

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	3	5	6	7	8
4	2	3	1	6	5	8	7
2	4	3	6	1	5	7	8
4	2	6	3	5	1	8	7
2	4	3	6	5	8	1	7
4	2	6	3	8	5	7	1
2	4	3	6	5	8	7	
4	2	6	3	8	5		7
2	4	3	6	8		5	7
4	2	6	3		8	7	5
2	4	6		3	8	5	7
4	2		6	8	3	7	5
4		2	6	3	8	5	7
	4	6	2	8	3	7	5
1	6	4	8	2	7	3	5

Let Fig M. be the Lead of any Course, produced by Constructional Rules.

In any Change in M let a number of the Extreme Bells (less than the total) take a step in the opposite direction to that they are taking in M.

Let the Bells be 2.3.4.6 and the Change the first.

	instead of.
2 4 3 6	2 4 3 6
2 3 4 6	4 2 6 3.

This introduces a fresh Running Order of the total number of Extreme Bells. The original Running Order must be regained before the bells can return to the same row from which they started. This can only be done as follows.

(a) The four bells can complete the Hunting Course movement they have started;

(b) The four bells can make a Dodging Movement among themselves.
(c) The Causing Order can be regained by a series of cyclical movements.
Rule The Causing Order cannot be regained by any movement which is not complete cyclical

In this Example a complete Ringing Course has been made on 2346.

2	4	3	6
2	3	4	6
3	2	6	4
3	6	2	4
6	3	4	2
6	4	3	2
4	6	2	3
4	2	6	3

and at its completion the Causing Order of M is regained

1	2	3	4	5	6	7	8	9	0
2	1	4	3	6	5	8	7	0	9
2	4	1	3	5	6	7	8	9	0
4	2	3	1	6	5	8	7	0	9
2	4	3	6	1	5	7	8	9	0
2	3	4	6	5	1	8	7	0	9
3	2	6	4	5	8	1	7	9	0
2	3	4	6	8	5	7	1	0	9
2	4	3	6	5	8	7	0	1	9
4	2	6	3	8	5	0	7	9	1
2	4	3	6	5	8	7	0	9	1
4	2	6	3	8	5	0	7	1	9
4	6	2	3	5	8	0	1	7	9
6	4	3	2	8	5	1	0	9	7
4	6	2	3	8	1	5	0	7	9
4	2	6	3	1	8	0	5	9	7
2	4	6	1	3	8	5	0	7	9
4	2	1	6	8	3	0	5	9	7
4	1	2	6	3	8	5	0	7	9
1	4	6	2	8	3	0	5	9	7
1	6	4	8	2	0	3	9	5	7

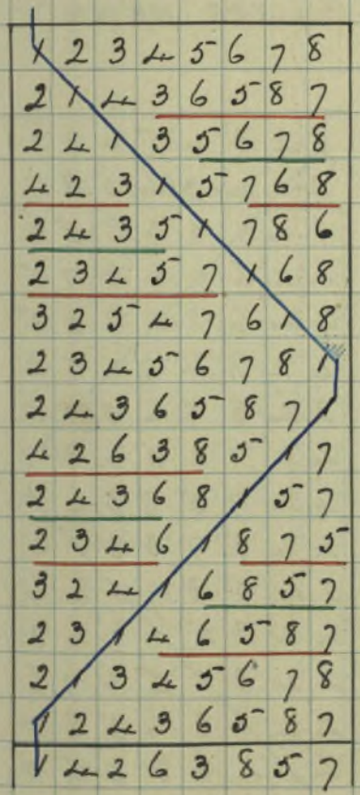
In this Example a dodging Movement is made on 2436 in the first Half Lead; and another similar, but quite independent one, in the second Half Lead.

2	4	3	6
2	3	4	6
3	2	6	4
2	3	4	6
2	4	3	6

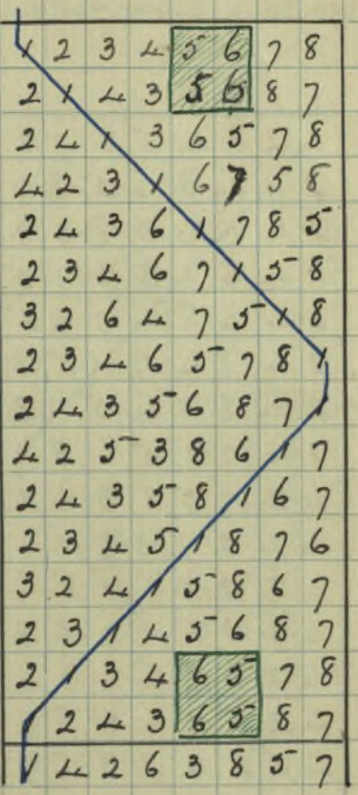
In both the foregoing Examples the movement of the Additional Plunk is begun in one Change and completed without interruption in the following successive Changes. In the next Example the Plunk is begun at the beginning of the Lead and not completed till the end.

THE CONSTRUCTIONAL SHUNTS

COSLANY C.B. MAJOR

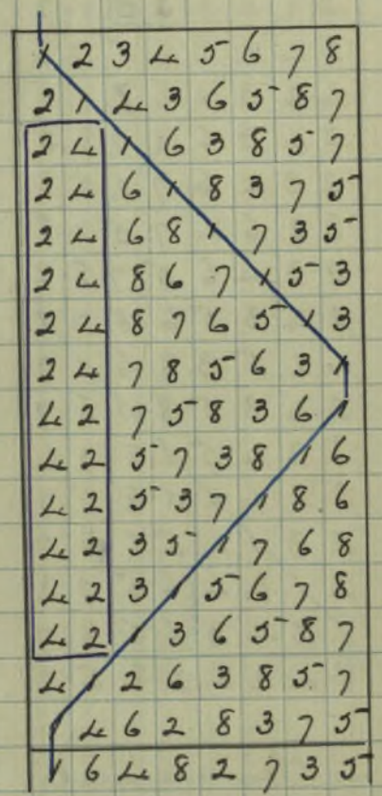


ADDITIONAL SHUNT ON 5-6.

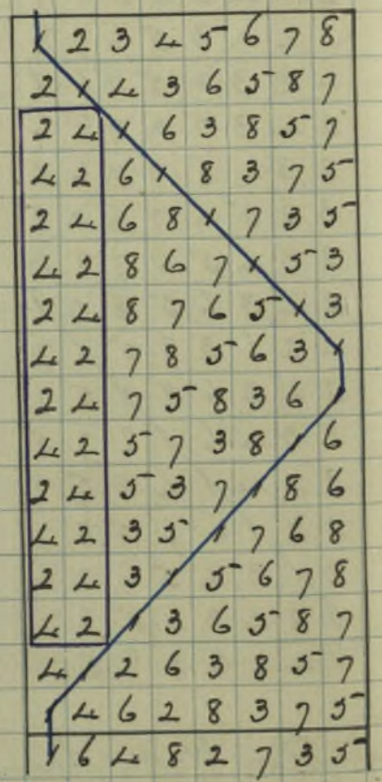


The Slow Work Shunts in their natural form are not suitable for use in practical methods. The blemishes may be removed by Additional Shunts, as follows:-

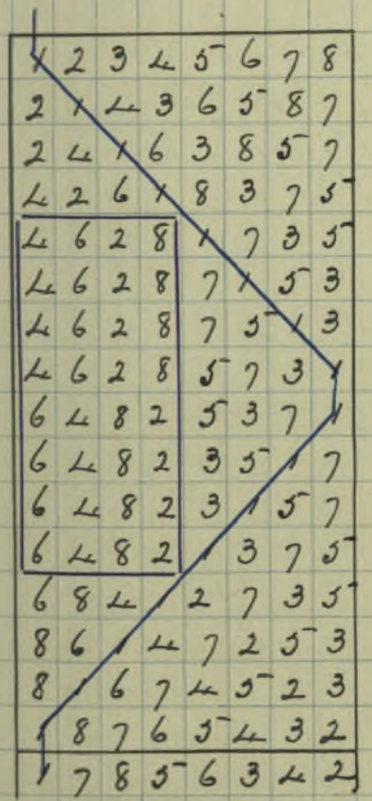
TWO BELL SLOW WORK SHUNT.



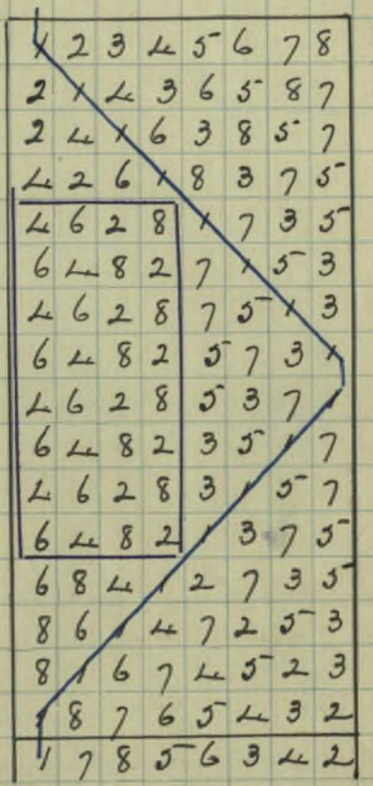
COLLEGE MAJOR.

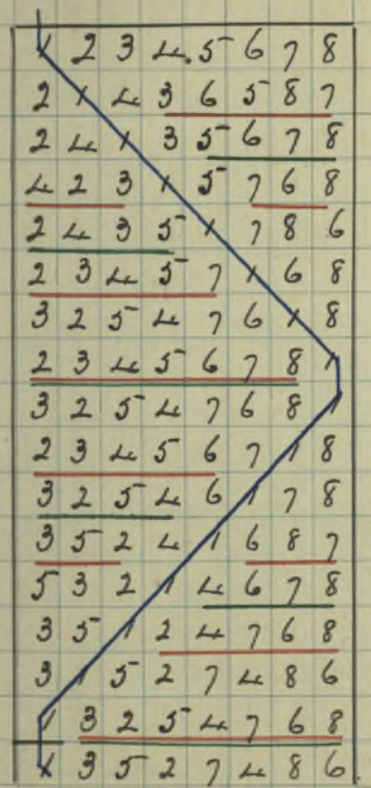


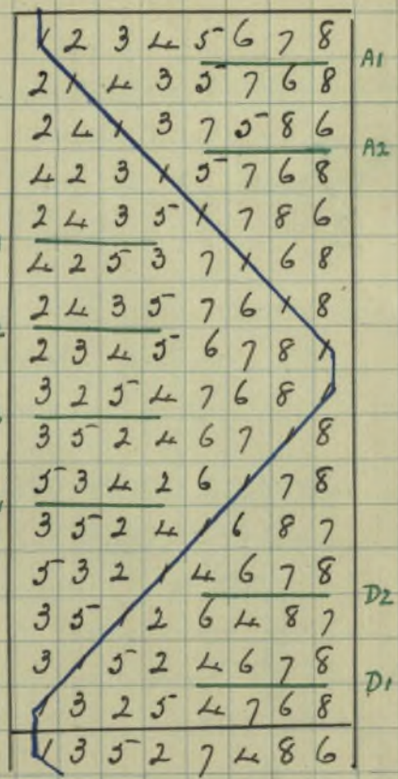
FOUR BELL SLOW WORK SHUNT



KENT COLLEGE MAJOR.







In this example four bells 5 6 7 8 in the first Change make one step backward instead of forward. In the third Change the same bells make one step forward instead of backward, the two making a complete Dodging Movement. Three other similar Additional Plunts, each independent of the others, are made

within the Lead.

If to any Lead produced by Constructional Shunts, a number of Additional Shunts is added, a fresh Lead is produced which has the same Lead End as the first Lead.

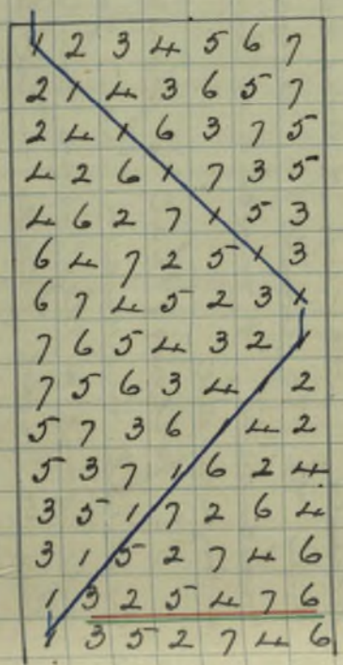
To this fresh Lead further Additional Shunts may be added, which will produce a third Lead, with the same Lead End.

The movements of the bells will be the results of the Principle, the Constructional Shunts and the various Additional Shunts. One step of any one Bell. may be the result of several Cyclical movements, + movement counteracting - movement.

It follows, that to show the different cyclical movements that go to make up some of the more complex methods, two or more Leads must be written out.

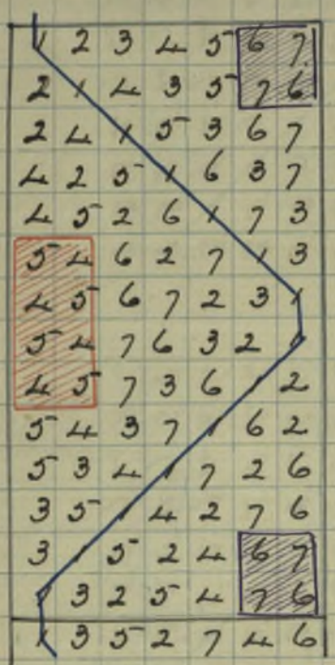
The following are Examples of these overlapping Additional Shunts.

1. The PLAIN PRINCIPLE
ONE EXTREME CONSTRUCTIONAL SHUNT. BOB. TRIPLES.

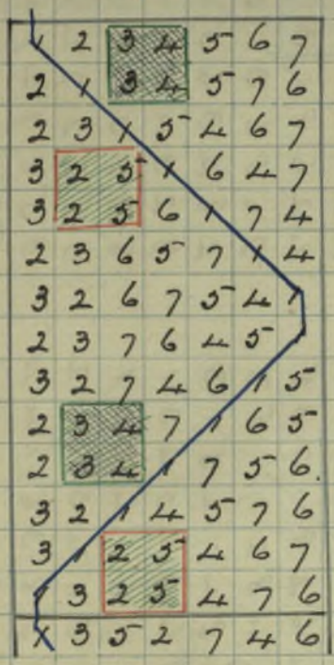


2 ADDITIONAL SHUNTS ON 5-6. and. 4-7.

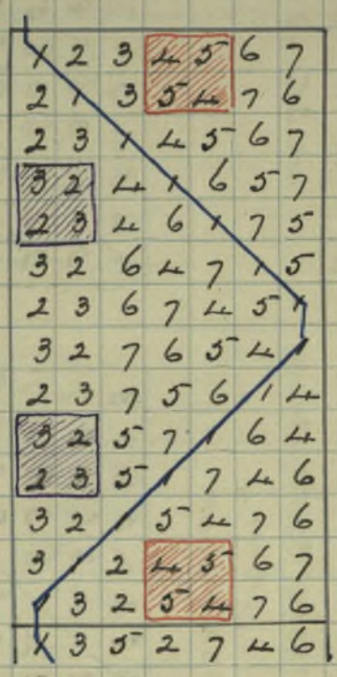
3. ADDITIONAL SHUNTS ON. 6-7 and. 4-5



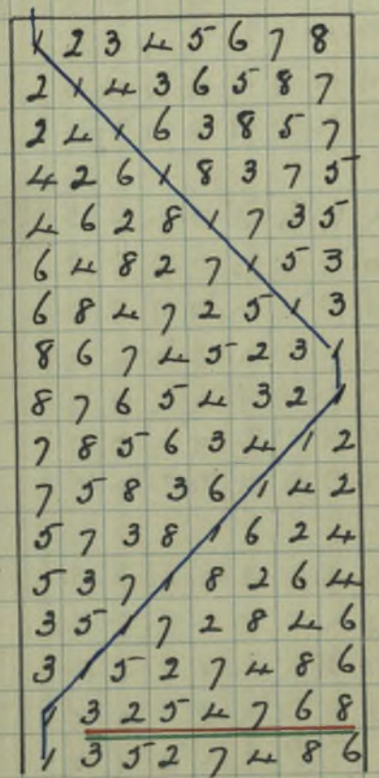
4. ADDITIONAL SHUNTS on 3-4 and. 2-5.



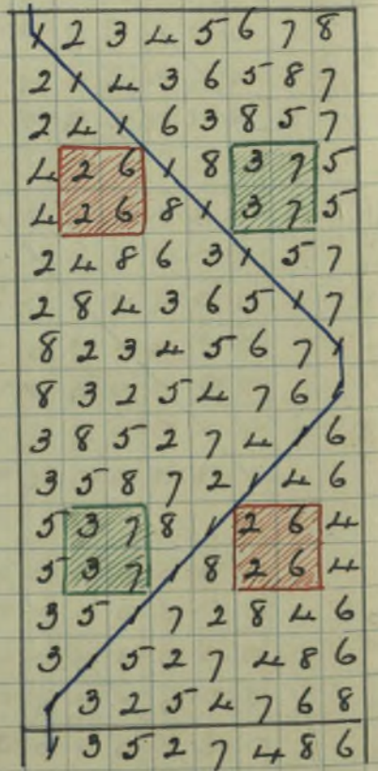
5. ADDITIONAL SHUNTS on 4-5 and. 2-3. NEW BOB. TRIPLES.



1. The PLAIN PRINCIPLE
EXTREME CONSTRUCTIONAL SHUNT.
BOB. MAJOR.



2. ADDITIONAL SHUNTS ON 2-6 and 3-7.



3. ADDITIONAL SHUNTS. ON. 3-4. 5-6 2-5. 4-7.

4 ADDITIONAL SHUNTS ON. 4-5(twice) 2-3. 6-7

BIRMINGHAM. BOB. MAJOR.

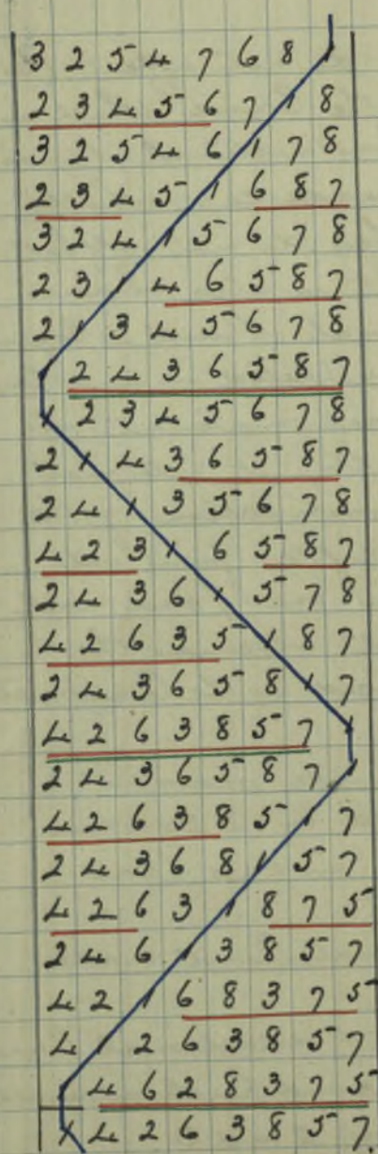
(First produced and named by. Henry Johnson).

Additional Shunts do not affect the main Construction of the Course which is the Concern of the Constructional Shunts; and when they are made each wholly within one Lead, they do not affect the Lead Ends. It is also obvious that if an Additional Shunt is begun in one Lead and completed in another, since it is a cyclical movement on a given number of Bells, it will not affect the main Construction of the Course. It will differ from one made wholly within one Lead only in the fact that it obscures the Lead Ends produced by the Constructional Shunts.

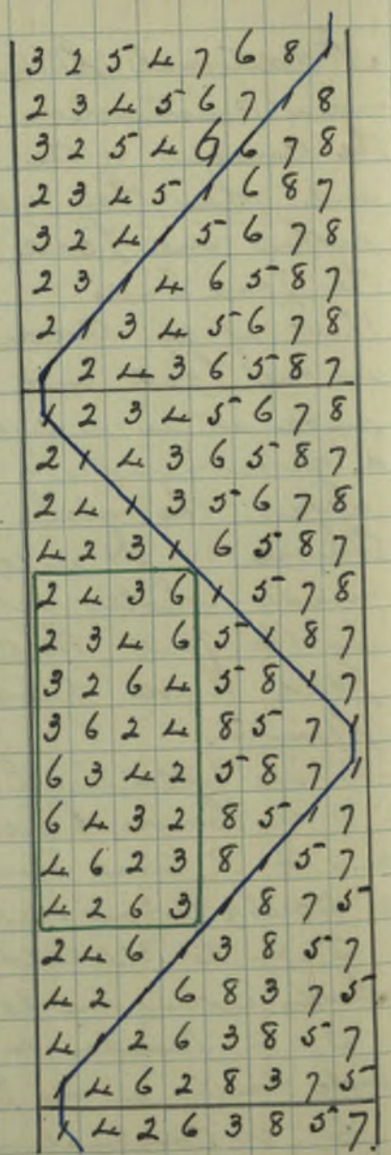
The following Example shows:-

1. a Course produced by 2 Extremes and 4 R Count Shunts in each Lead, (= Double Oxford Major)
2. a 4-Bell Additional Shunt made wholly within one lead.
3. a Similar 4 Bell Additional Shunt made partly in one Lead and partly in another.
4. a Combination of 2 and 3.

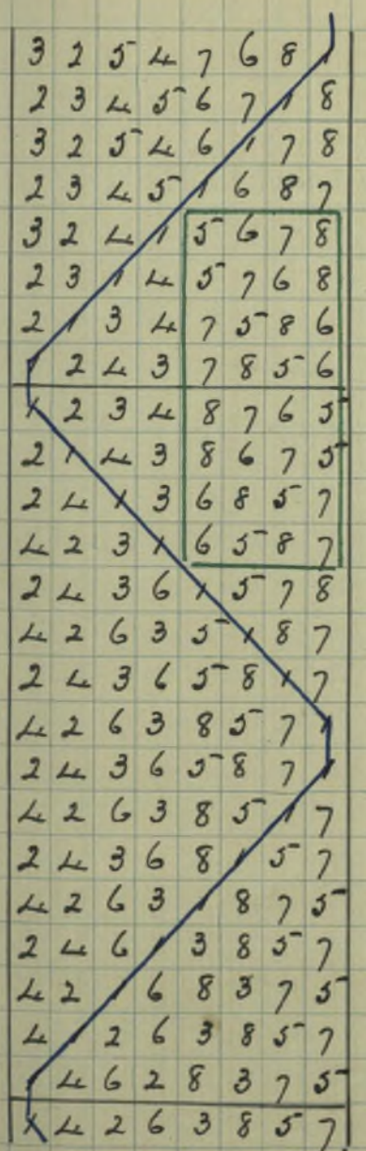
1.



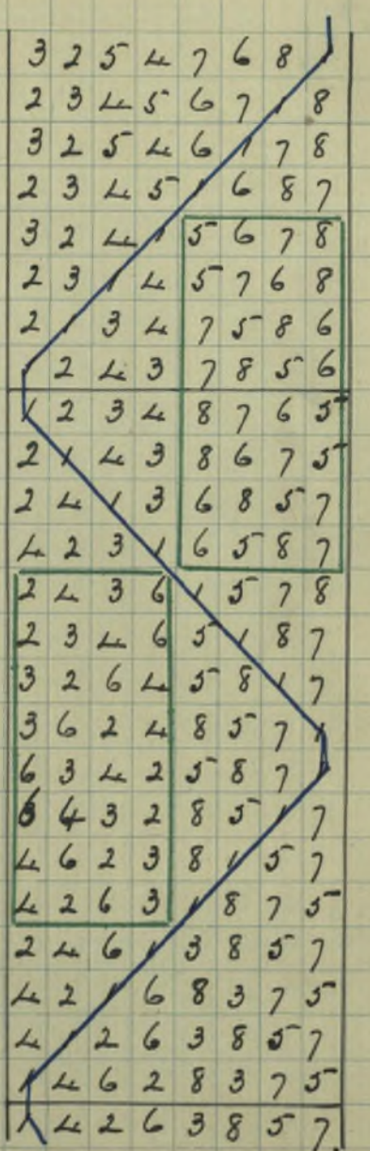
2.



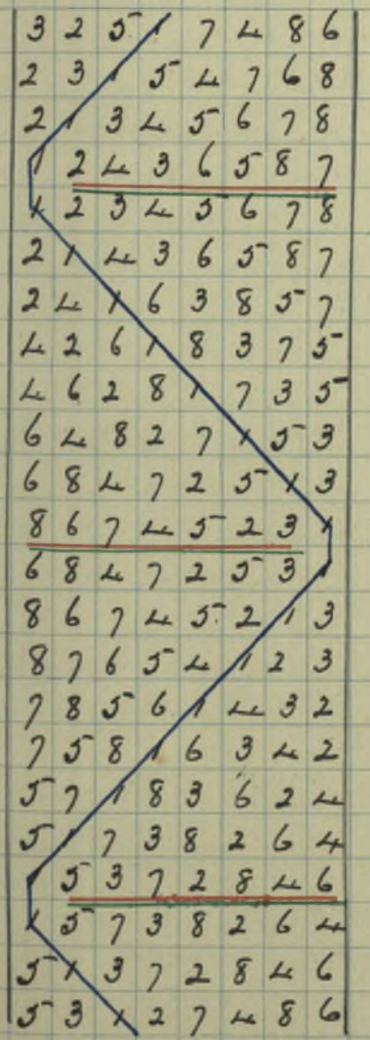
3.



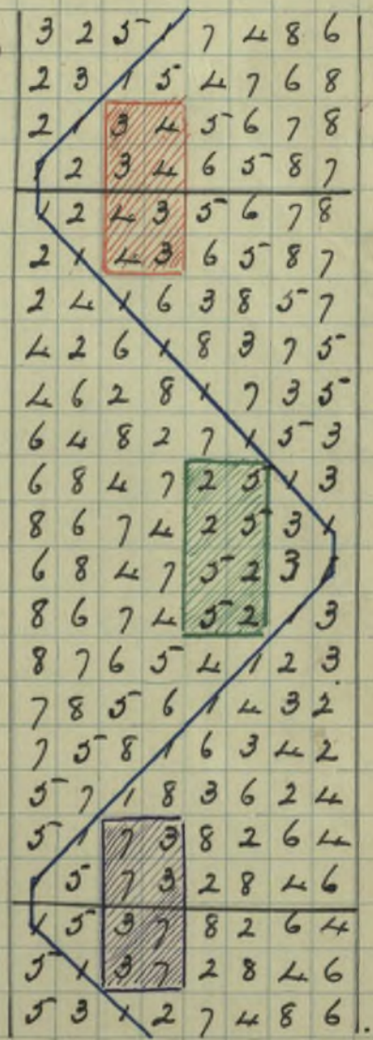
4.



DOUBLE BOB MAJOR.



DOUBLE CANTERBURY PLEASURE MAJOR.



In the Examples I have given the Additional Shunts made partly in one Lead and partly in another, are yet made continuously and in Consecutive Changes. Additional Shunts made in parts which are separated from each other, or Additional Shunts which overlap each other, will not, in other respects, be different in nature from these Examples.

The construction of every possible Method on the Main Principle whether symmetrical or not, whether good or bad according to any standard, is produced by some form of the Shunts I have described in the last five chapters.

Chapter X

Methods which are founded on Hunts and Extreme Bells (Continued)

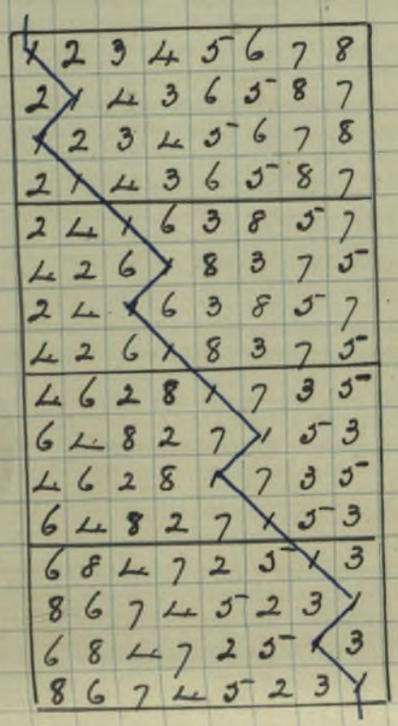
Methods on the Treble Bob Principle

The Treble Bob Principle consists of the cyclical movement of the Plain Principle, with the addition of certain Dodging Movements arranged symmetrically. It produces exactly the same Rows as the Plain Principle, and in the same order, but with repetitions.

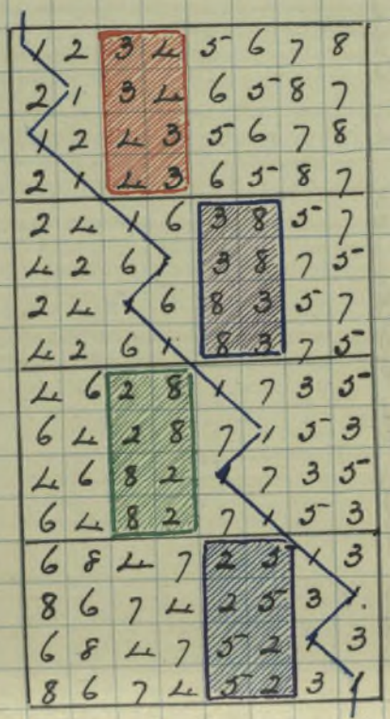
It follows that every Plunt, and every Combination of Plunts, which will work on the Plain Principle, can be applied to the Forward movement of the Treble Bob Principle, and will give exactly the same results and produce the same Rows. But since no Method may contain repetition of Rows further Plunts must be introduced to clear the natural Falseness of the Principle.

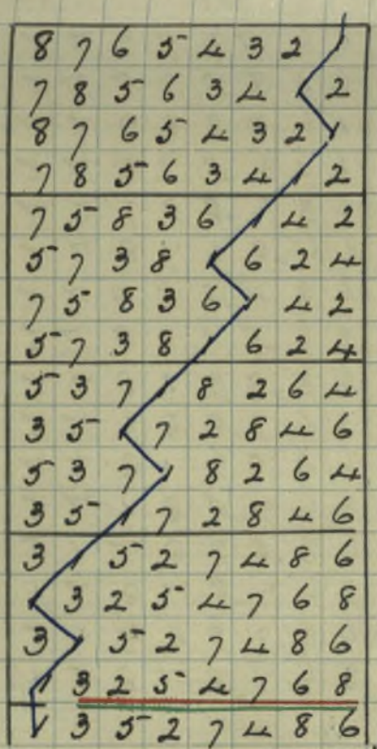
These Shunts will in the majority of cases (but not always) be additional Shunts, and their nature and uses can best be explained by Examples.

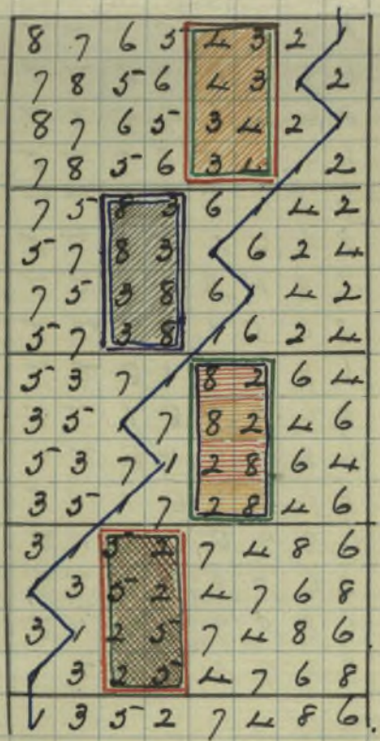
TREBLE BOB. PRINCIPLE
ONE EXTREME SHUNT.



KENNINGHALL. T.B. MAJOR.

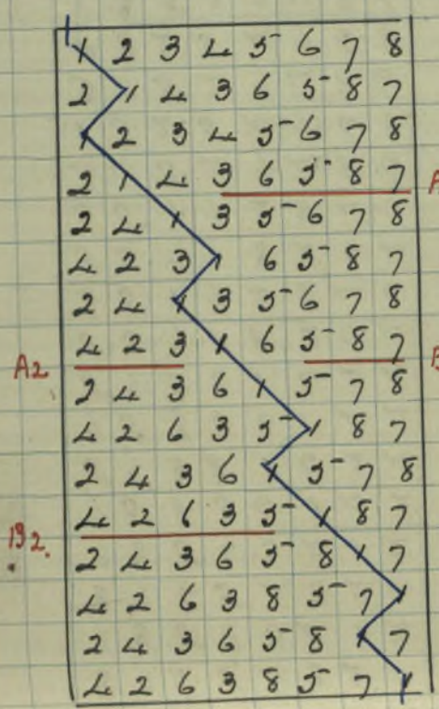


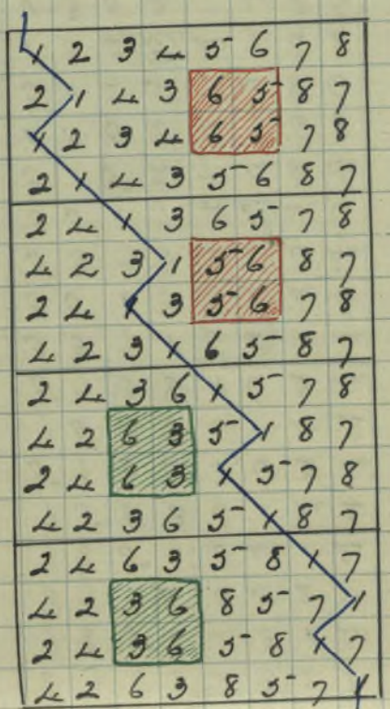


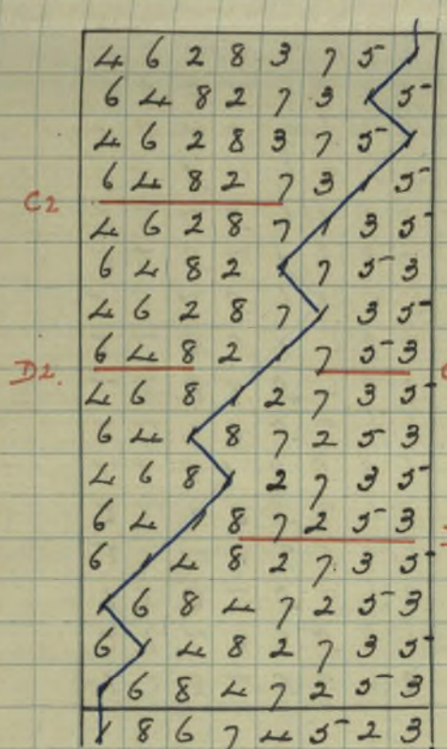


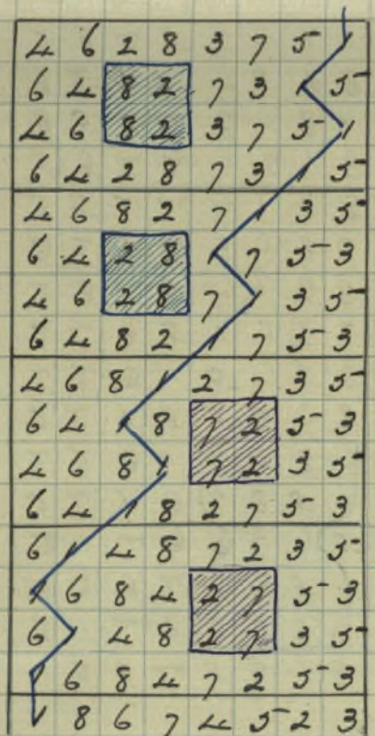
T. B- PRINCIPLE
FOUR. TR. COURT. SHUNTS.

NORFOLK S. MAJOR.









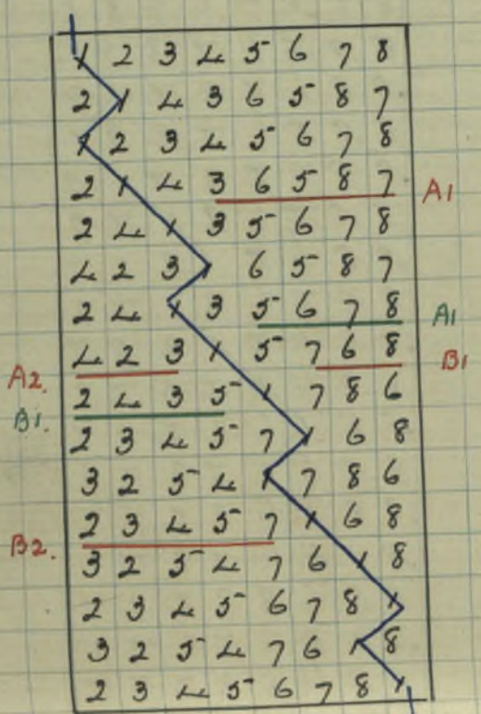
201

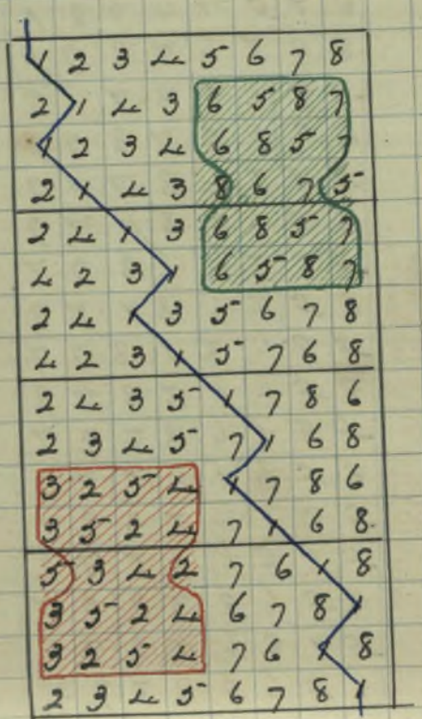
T. B. PRINCIPLE.

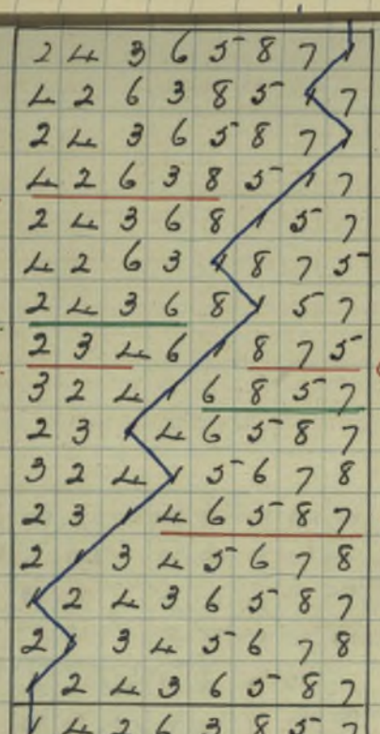
FOUR. R. COURT SHUNTS.

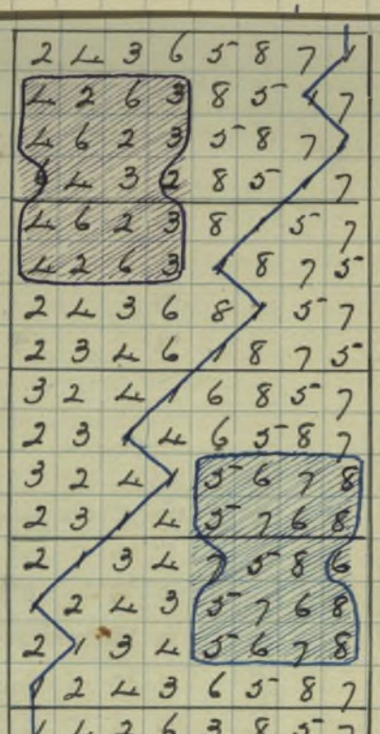
TWO. T. COURT SHUNTS.

BRISTOL S. MAJOR.









208

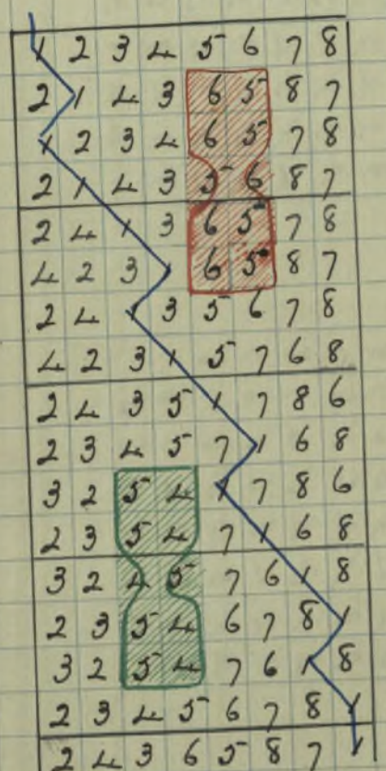
T. B. PRINCIPLE.

FOUR. R. COURT SHUNTS.

TWO P. COURT SHUNTS.

As page. 208.

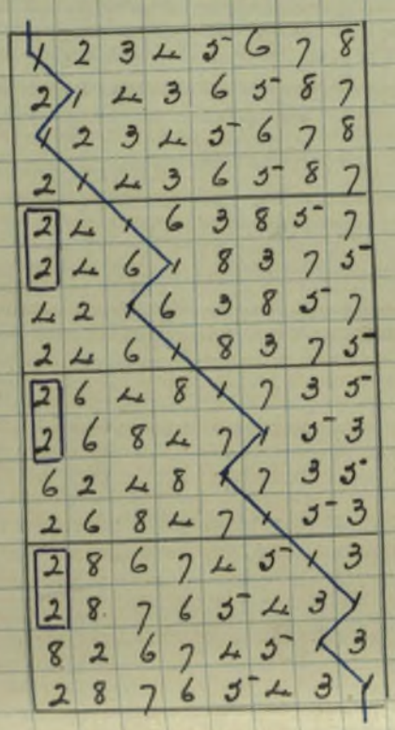
THETFORD. S MAJ.



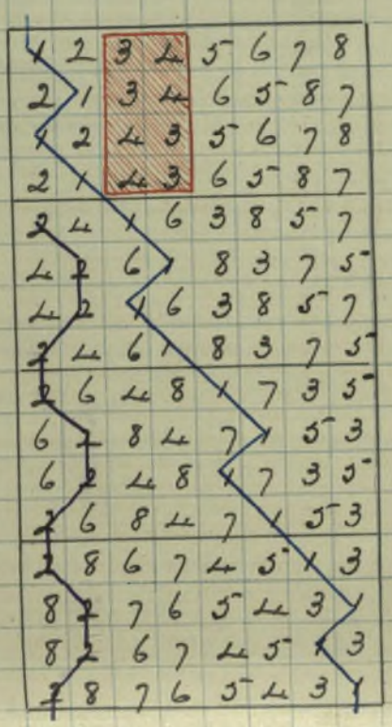
1 2 3 4 5 6 7 8

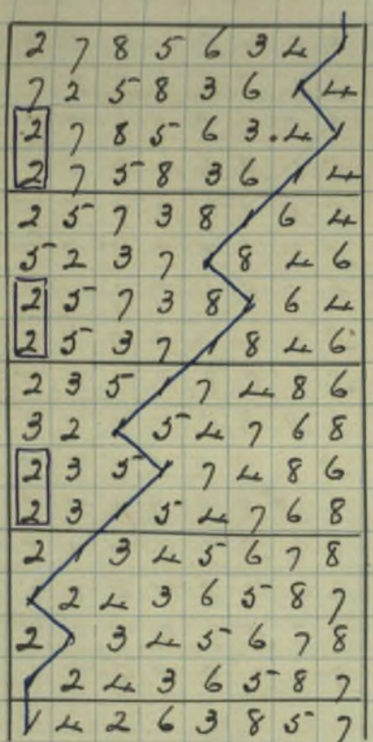
T. B. PRINCIPLE

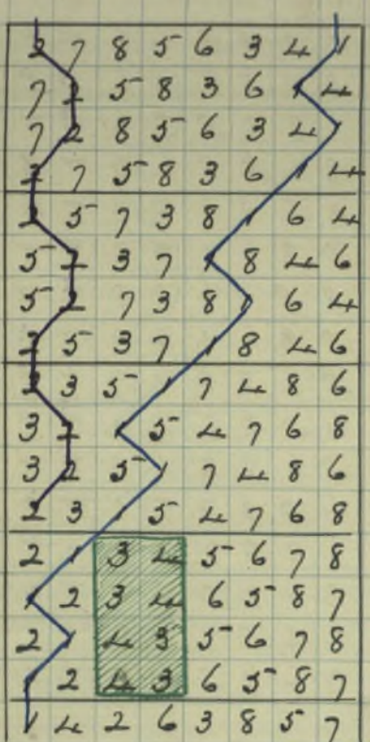
ONE BELL SLOW WORK SHUNT.
See Page 176.



KENT. T. B. MAJOR.



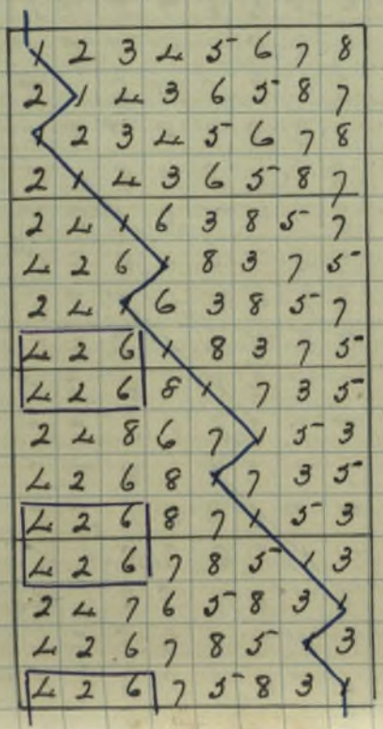




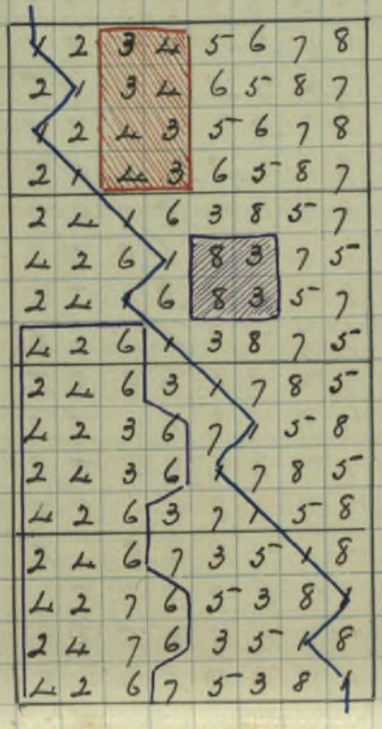
T. B. PRINCIPLE

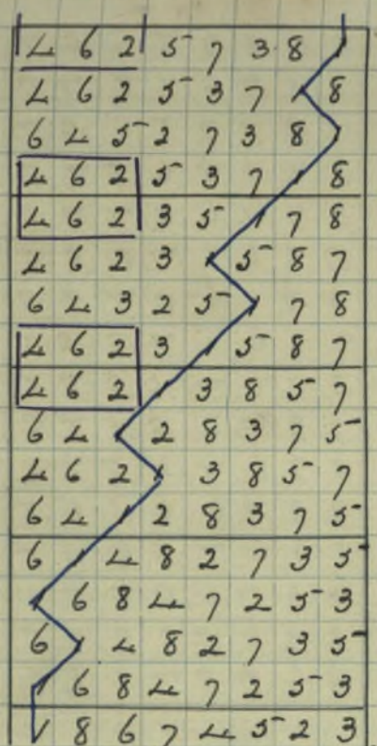
THREE BELL SLOW WORK SHUNT

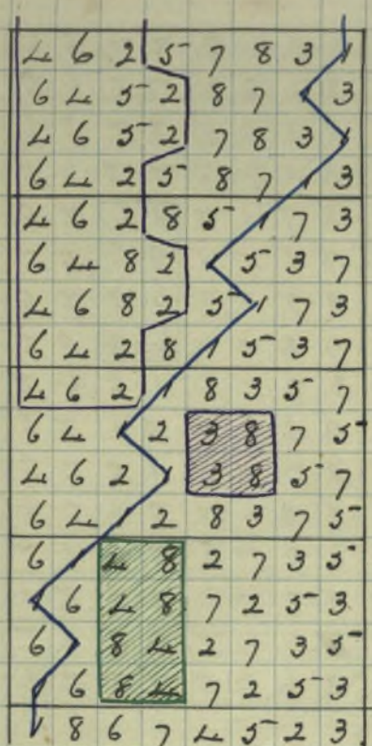
(See Page 180)



DISS D. MAJOR.

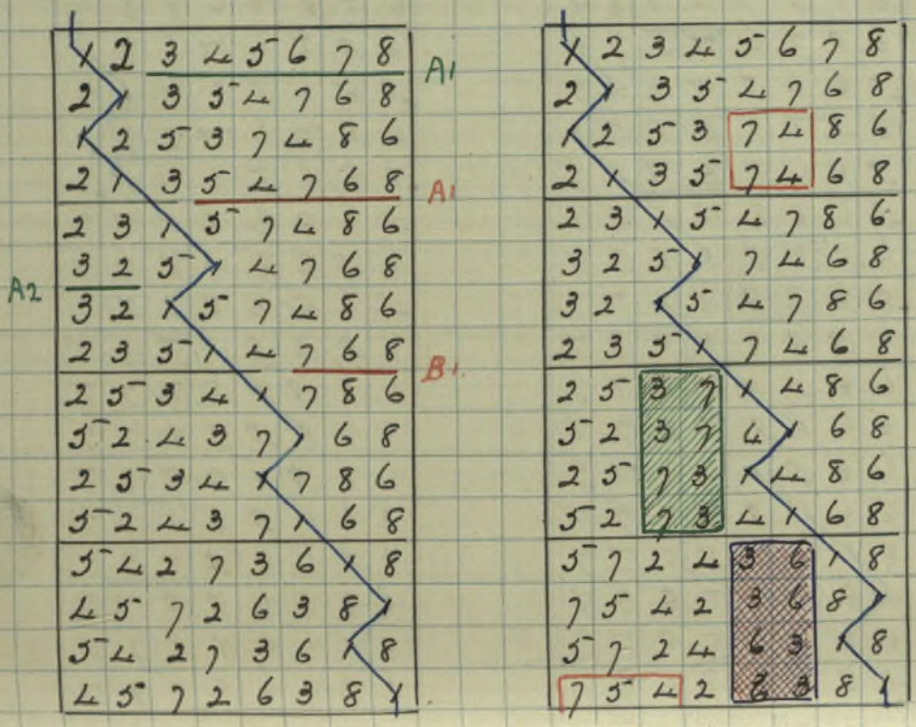


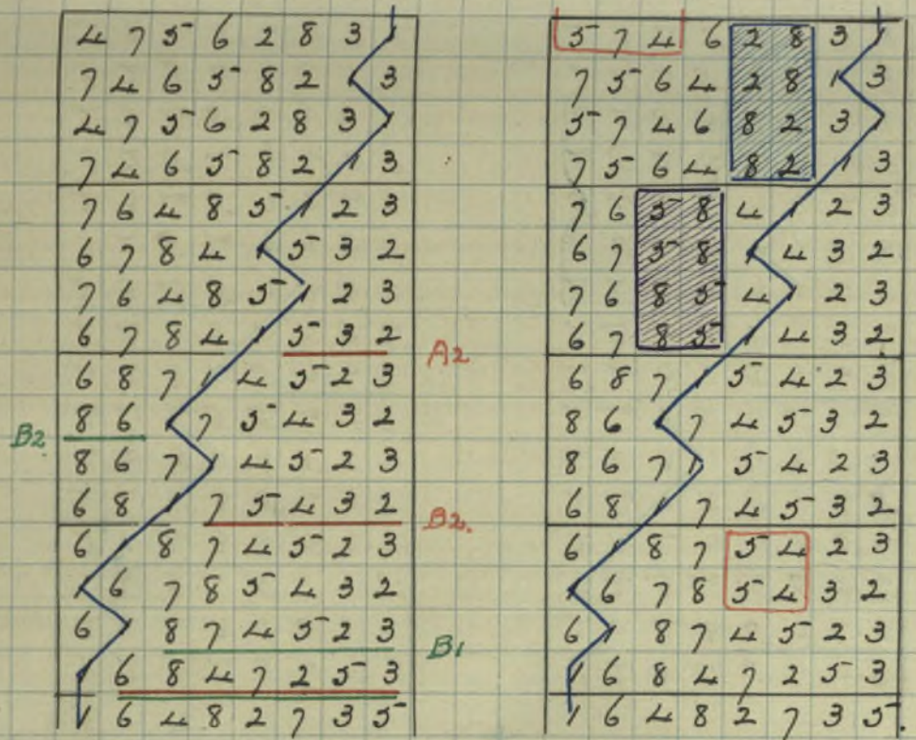




T. B. PRINCIPLE.

TWO. P. COURT SHUNTS.
TWO. R. SINGLE COURT SHUNTS
ONE EXTREME SHUNT.



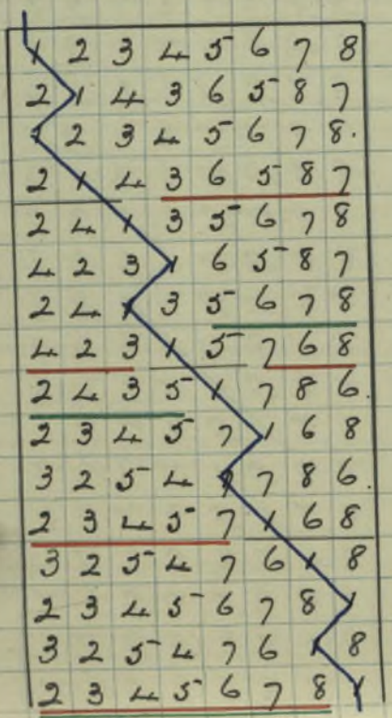


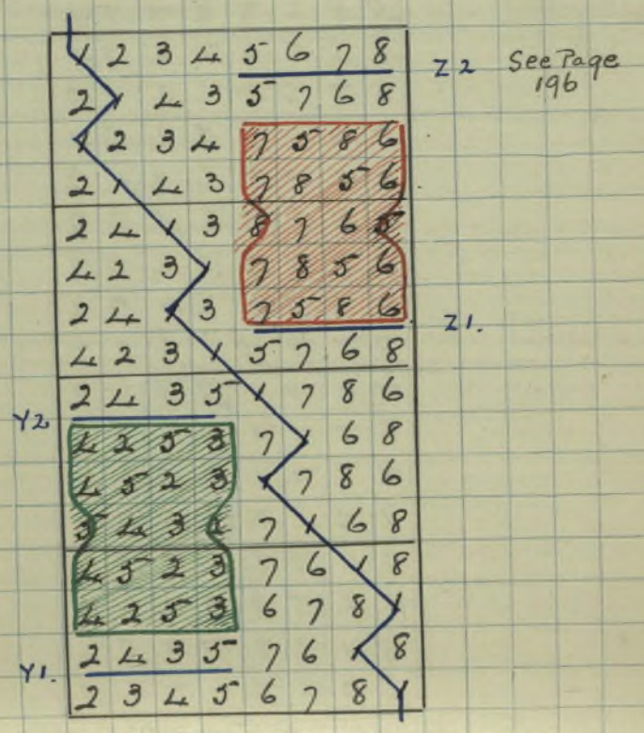
T. B. PRINCIPLE.

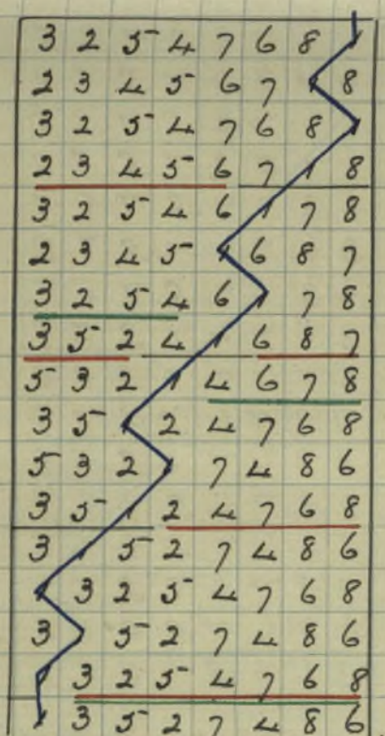
FOUR R. COURT SHUNTS

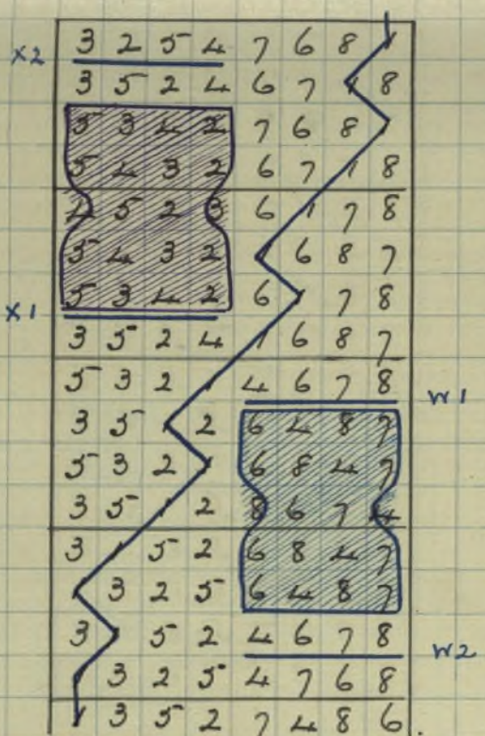
TWO. P COURT SHUNTS

TWO EXTREME SHUNTS.



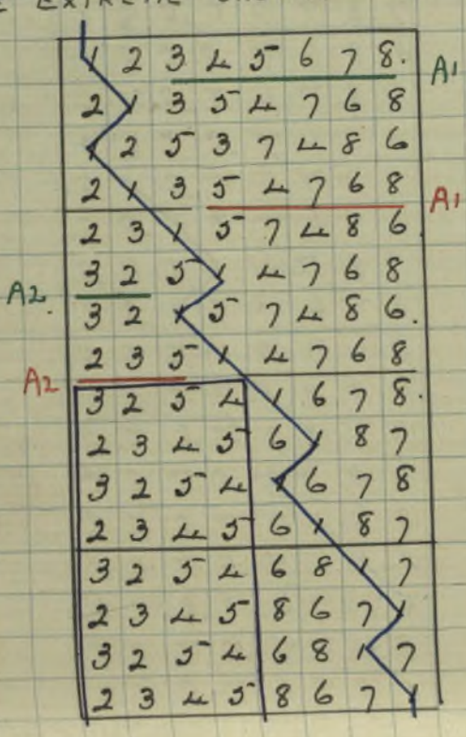


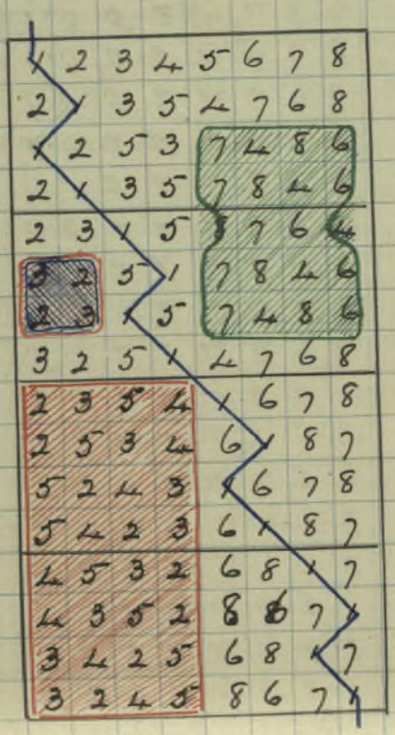


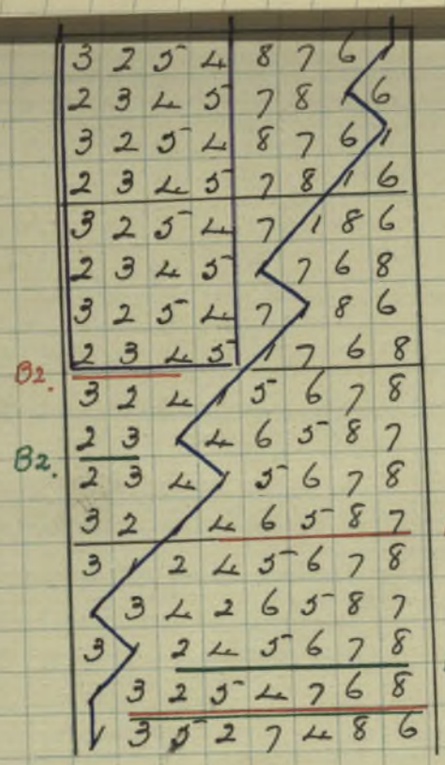


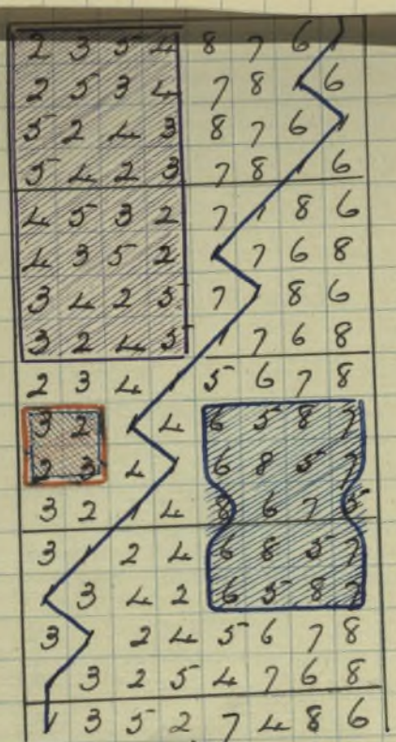
TREBLE BOB. PRINCIPLE

TWO R COURT SHUNTS
TWO P. COURT SHUNTS.
ONE FOUR BELL SLOW WORK SHUNT
ONE EXTREME SHUNT.









The Extreme Shunts and the P Court Shunts are made at a point in the movement of the Principle which is not repeated. Therefore their number and positions are exactly the same in the Treble Bob Principle as in the Plain Principle. But the P. Court Shunts are made in positions which are re-duplicated by the Treble Bob dodging. Therefore there are alternative positions in which they may be made. A P. Court Shunt can take one of the following forms.

1.

	2	×	4	3	6	5	8	7
	2	4	×	6	3	8	5	7
	4	2	6	×	3	5	8	7
	2	4	×	6	5	3	7	8
	4	2	6	×	3	5	8	7
A2	4	6	2	3	×	8	5	7
	4	2	6	3	8	×	7	5
	2	4	3	6	×	8	5	7
	4	2	6	3	8	×	7	5
	4	6	2	8	3	7	×	5

A1

2.

	2	×	4	3	6	5	8	7
	2	4	×	6	3	8	5	7
	4	2	6	×	3	5	8	7
	2	4	×	6	5	3	7	8
	4	2	6	×	3	5	8	7
	4	6	2	3	×	8	5	7
	6	4	3	2	8	×	7	5
A2	4	6	2	3	×	8	5	7
	4	2	6	3	8	×	7	5
	4	6	2	8	3	7	×	5

A1

3

2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
2	4	1	6	3	8	5	7
4	2	6	1	3	5	8	7
4	6	2	3	1	8	5	7
4	2	6	3	8	1	7	5
2	4	3	6	1	8	5	7
4	2	6	3	8	1	7	5
4	6	2	8	3	7	1	5

A1 A2

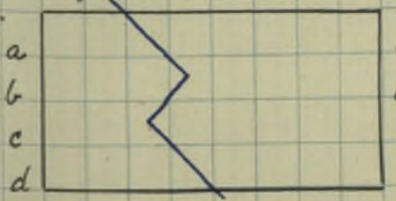
4

2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
2	4	1	6	3	8	5	7
4	2	6	1	3	5	8	7
4	6	2	3	1	8	5	7
6	4	3	2	8	1	7	5
4	6	2	3	1	8	5	7
4	2	6	3	8	1	7	5
4	6	2	8	3	7	1	5

A1 A2

And similarly with every other Section of the Principle; there are four alternative positions in which a P Court Shunt may be made.

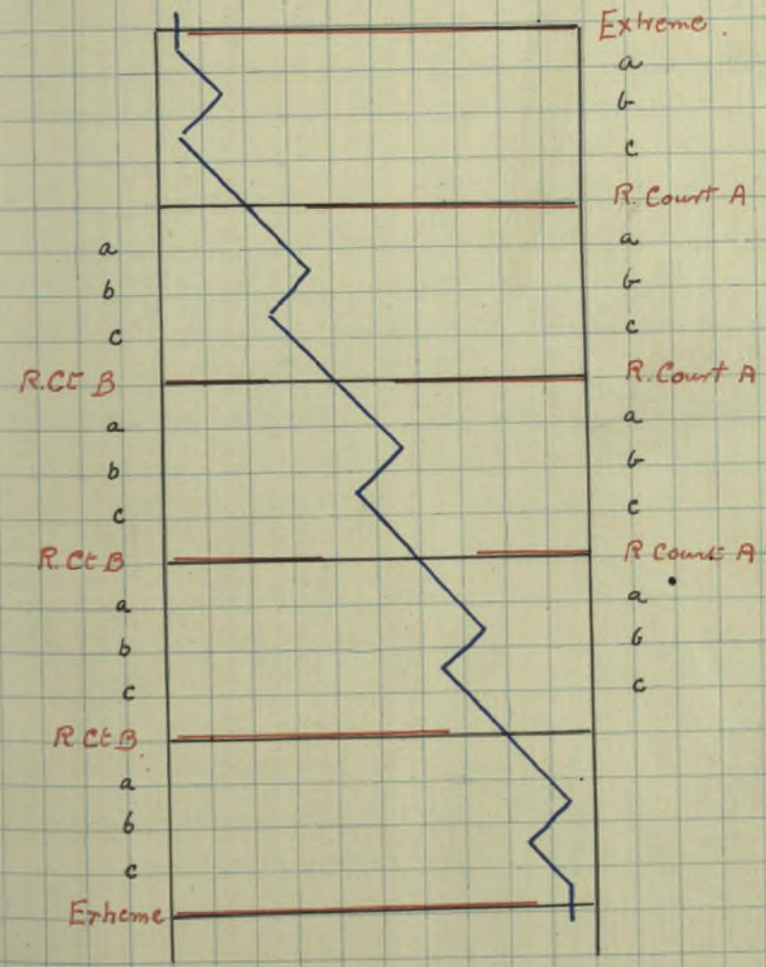
M.



Let M be any one Section of the Treble Bob Principle The Change d.d. belongs to the Forward Hunting Course part of the movement. It is here that Extremes and R. Court Shunts are made.

The Change. b.b. belongs to the Dodging

Positions in the Treble Bob Principle
in which Extreme and Court Shunts can
be made.



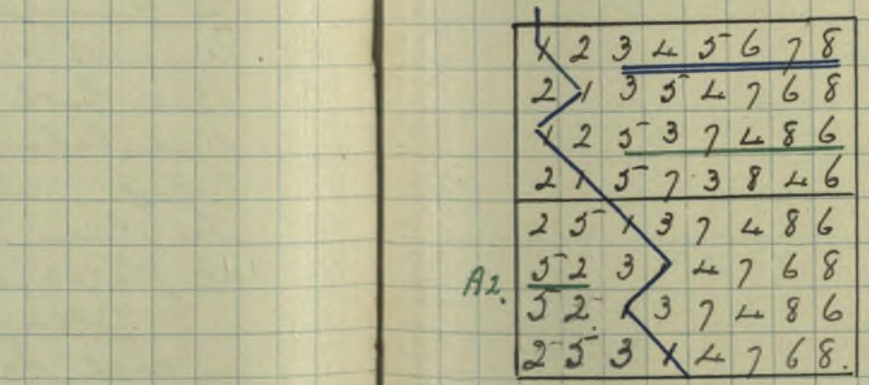
Movement exclusively, and therefore the

Shunts of the Plain Principle cannot be reproduced there.
Either (a) or (c) can belong to the Forward Hunting Course; and therefore at either the corresponding Shunts of the Plain Principle can be reproduced.
But both (a) and (c) cannot, at the same time, belong to the Forward Hunting Course; and therefore the Shunts of the Plain Principle cannot be reproduced, at the same time, at both (a) and (c)
It follows that there are two positions in each Section in which Constructional Shunts can be made which are peculiar to the Treble Bob Principle,—
viz. (b)
and (a) when (c) is taken for a P Court Shunt.

Shunts made at (b) I call B.S. Court Shunts
Shunts made at (a) when a P Court Shunt is made at (c) I call H.S. Court Shunts.

An H.S. Court Shunt (being made when the movement of the Principle is

forward) is very similar to the P Court Shunt. The only difference is in the position in which the second part of the Shunt is made



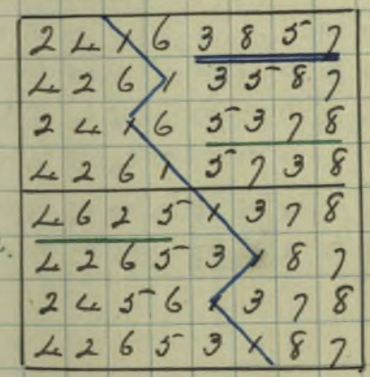
H.S Court. Shunt. (incomplete)

P. Court Shunt. A1.

In a P Court Shunt all the bells above the Hunt make one step backward; the place making bell crosses the Hunts' path, and at once all the bells below the Hunt make one backward step

In a H.S. Court Shunt, the first part of the Shunt is immediately followed by the first part of a P Court Shunt. This prevents the place making bell of the first Shunt from crossing the Hunts path; and therefore the bells below the Hunt are not in the proper position to make the second part of the Shunt. Nor will they take into such a position during

The Lead unless they happen to do so as the result of other Constructional or Additional Shunts. H.S. Court Shunts, therefore, cannot be used independently of other Shunts.



H.S. Court Shunt (incomplete)

P. Court Shunt. A1

In the Example on page. 218 to complete the Shunt 2 and 4 must make each a backward step.
In the above Example. 4263 must each make a backward step to complete the Shunt.

Thus.

$$\frac{4623}{4263}.$$

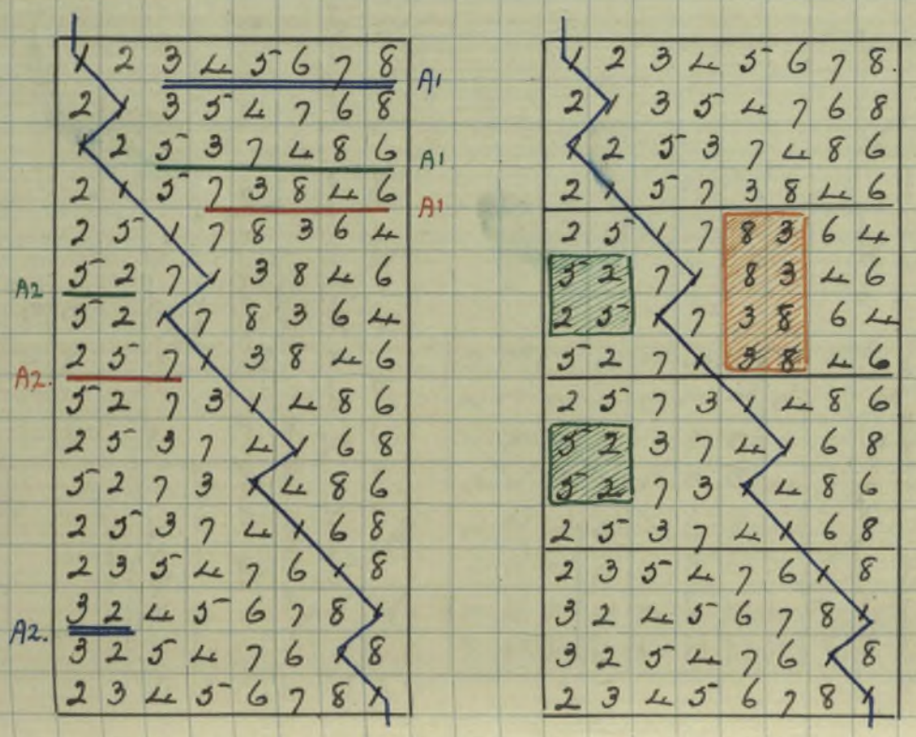
The following are Methods containing H.S. Court Shunts.—

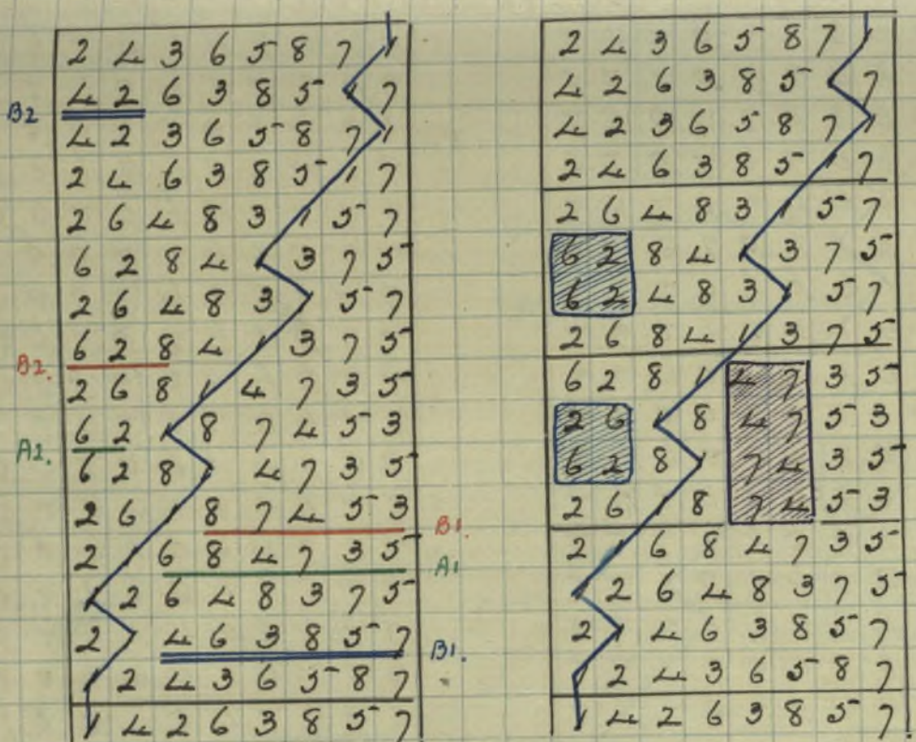
T. B. PRINCIPLE.

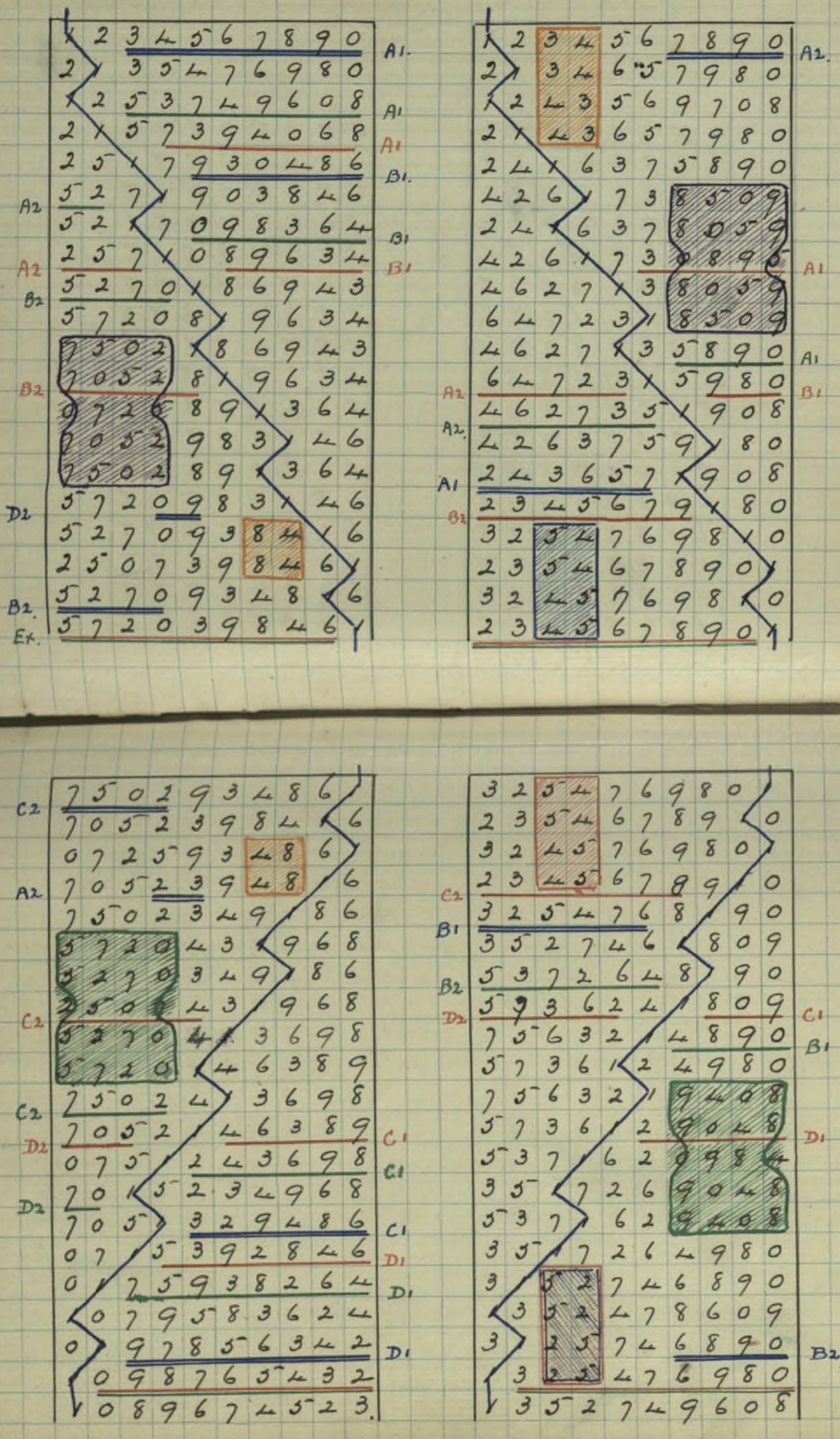
TWO R. COURT SHUNTS

TWO P do do

TWO H.S. do do.






A1.
A1
A1
B1.
A2
B1
A2
B1
B2
B2
D2
B2.
Ex.
A2.
A1
A1
B1
A2
A2.
A1
B1
C2
A2
C2
C2
C2
D2
C1
C1
D2
C1
D1
D1
D1
C2
B1
B2
D2
C1
B1
D1
B2.

B.S. Court Shunts are made in the Changes of the Principle when the movement is backward. The first part of the Shunt consists of the Extreme Bells on one side of the Hunt, changing the backward movement for forward movement. To Complete the Shunt the place making bell must cross the Hunt path and join the rest of the Extreme Bells. These bells then make one step forward instead of one step backward.

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	4	6	3	8	5	7
2	1	6	4	8	3	7	5
2	6	1	8	4	7	3	5
6	2	8	1	7	4	5	3
2	6	1	8	7	5	4	3
6	2	8	1	5	7	3	4
6	8	2	5	1	3	7	4

B.S. Court Shunt. Incomplete

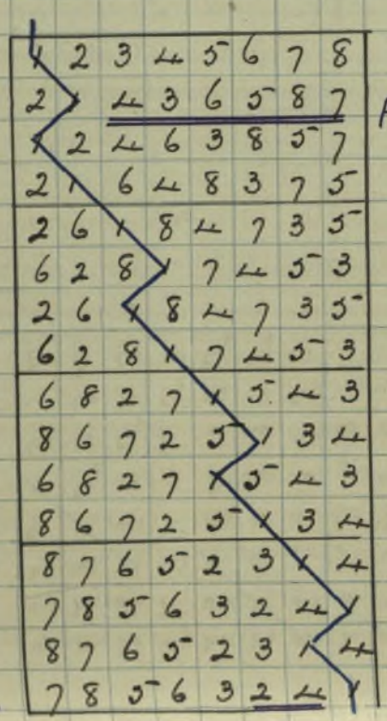
B.S Court Shunt. Incomplete

As with H.S. Court Shunts the position of the second part of the B.S. Court Shunt depends on other Conventional and Additional Shunts.

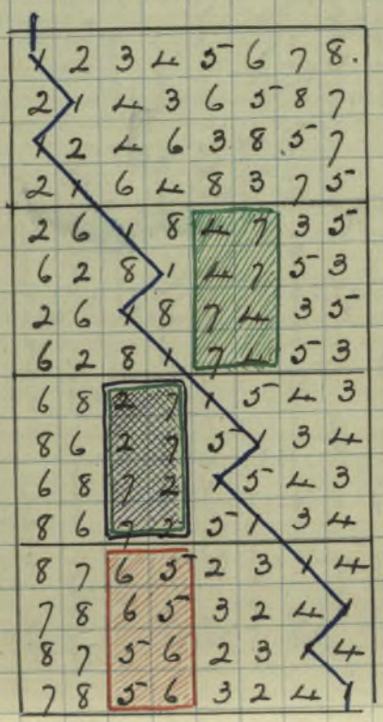
T. B. PRINCIPLE.

TWO B·S· COURT SHUNTS

SOHAM. T·B· MAJOR.

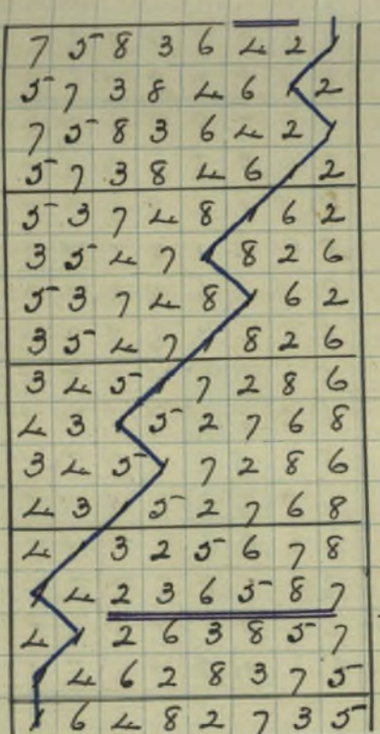


A1



* A2

* B2



B1

No add! Shunt here - ESP

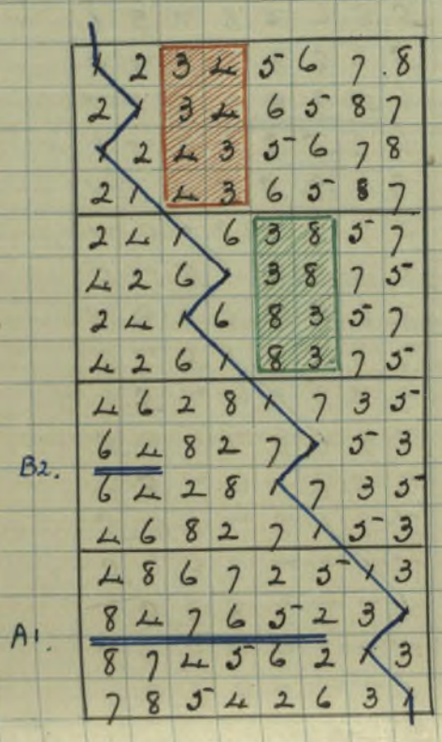
* Both Shunts A and B require movement on 2-4 and the double movements cancel each other.

213.

T. B. PRINCIPLE

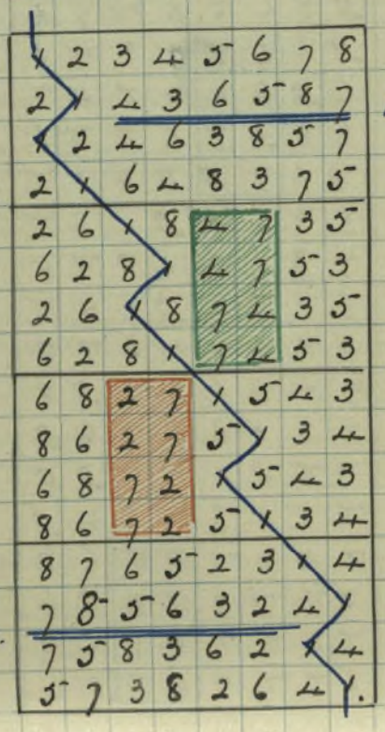
Two B-S Court Shunts.

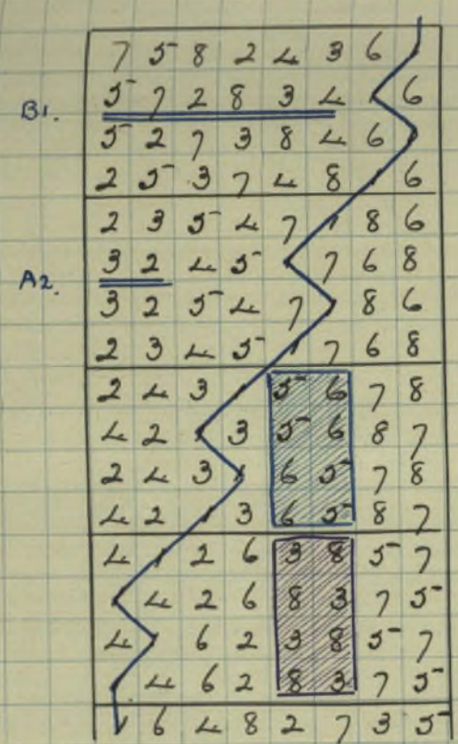
Wisbach T.B. Major.

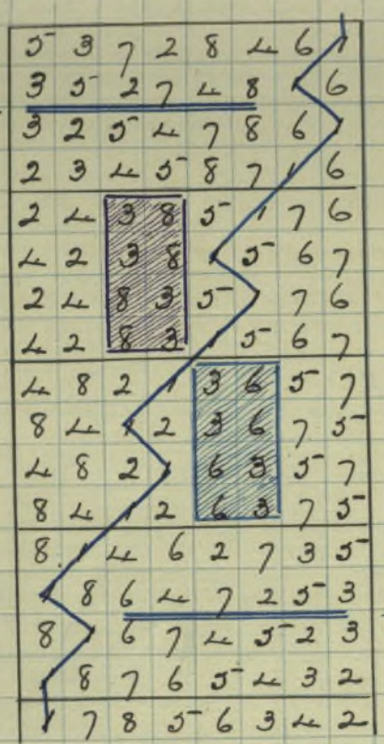


Four B-S Court Shunts

Sutterton T.B. Major.







* A1. and B2 each requires movement on 2-4 to complete the Shunt. These cancel each other. Similarly C' and D' each requires movement on 8-6. These cancel each other.

H.S. Court Shunts (being made when the movement of the Principle is forward) have the effect of changing the positions of the Hunts and the bells next before it in Coursing Order. The Hunt makes one step forward in its cyclical path through the Coursing Order of the Extreme Bells.

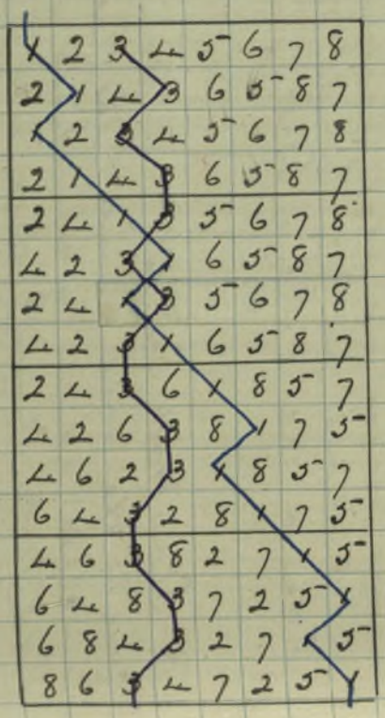
B.S. Court Shunts (being made when the movement of the Principle is backward) have the effect of changing the positions of the Hunts and the bells next after it in Coursing Order. The Hunt makes makes one step backward in its cyclical path through the Coursing Order of the Extreme Bells.

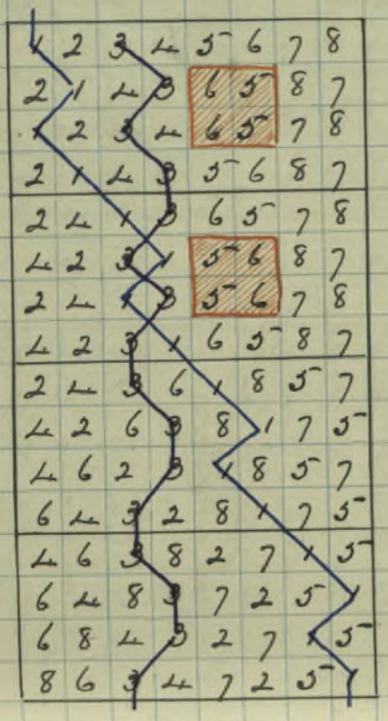
B. Slow Work Shunts As in the case of the Court Shunts, the Treble Bob Principle admits of variations of the Slow Work Shunts which will not run on the Plain Principle The following are examples —.

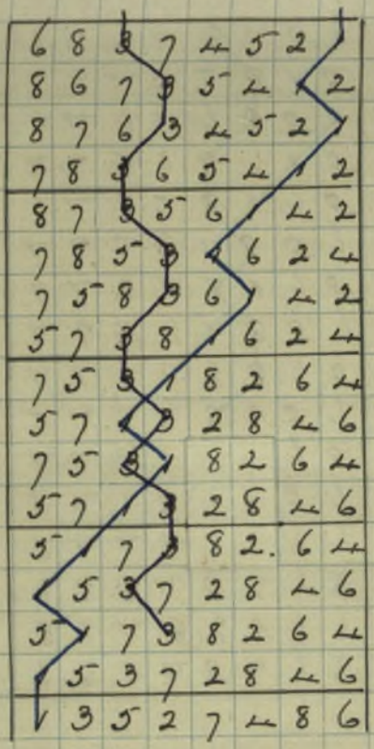
T. B. PRINCIPLE.

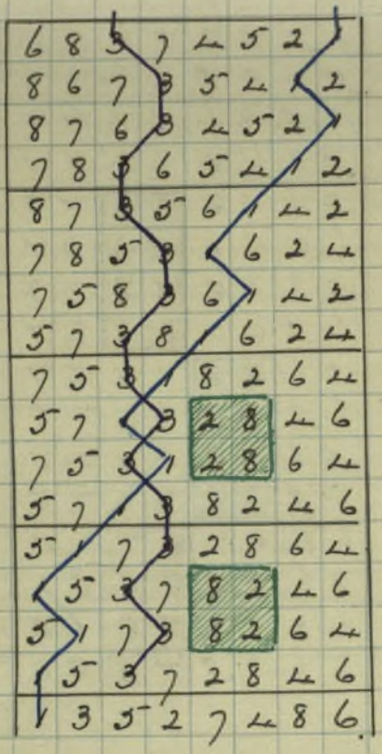
B. SLOW WORK SHUNT

BLÉCOURT. S. MAJOR.



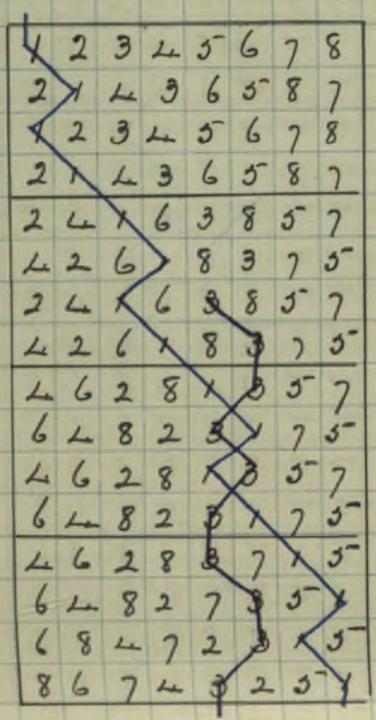




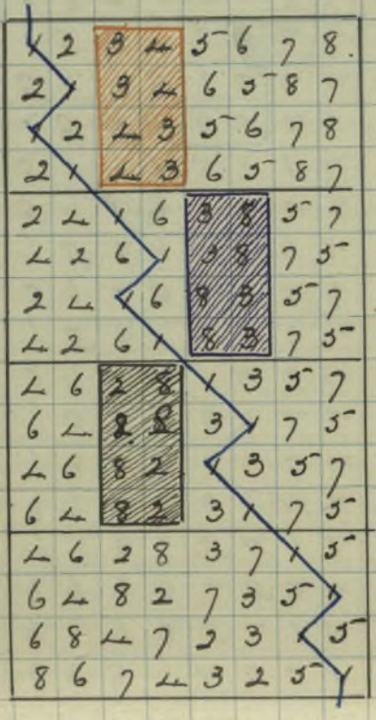


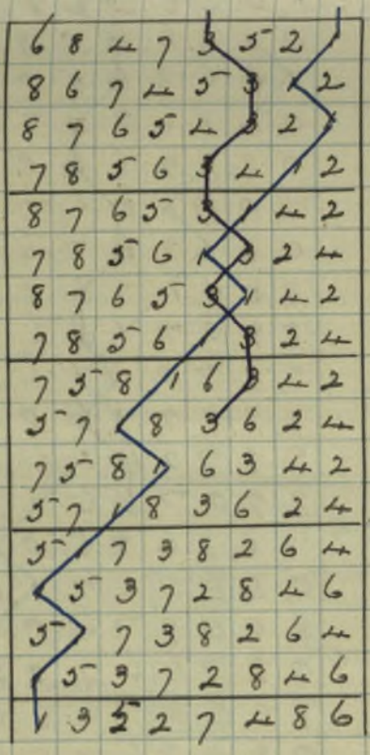
T. B. PRINCIPLE

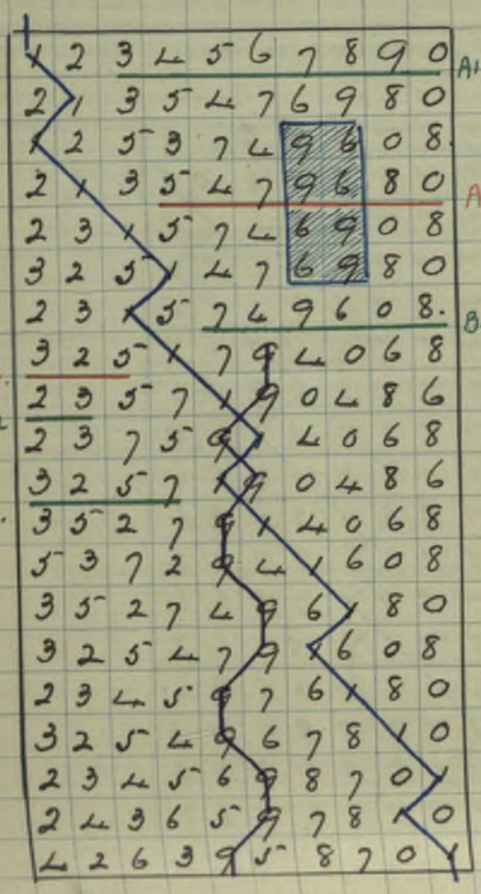
B. SLOW WORK SHUNT

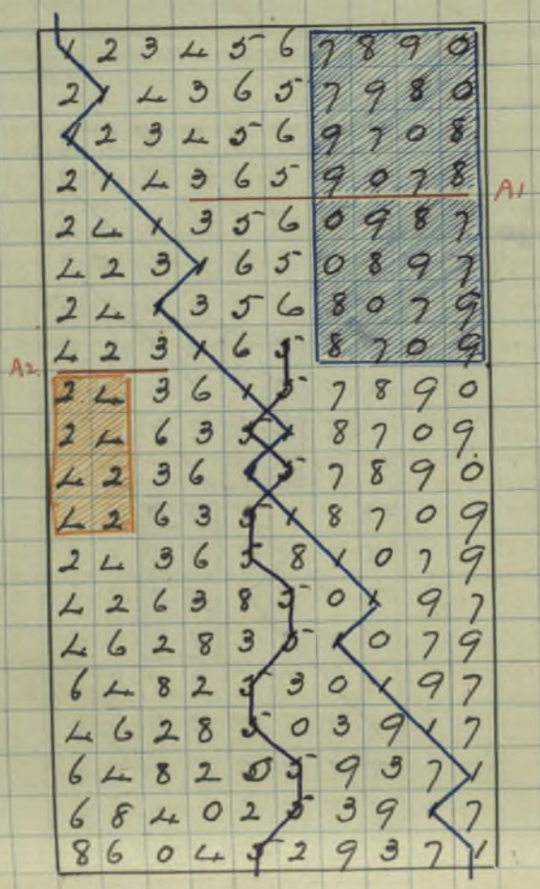


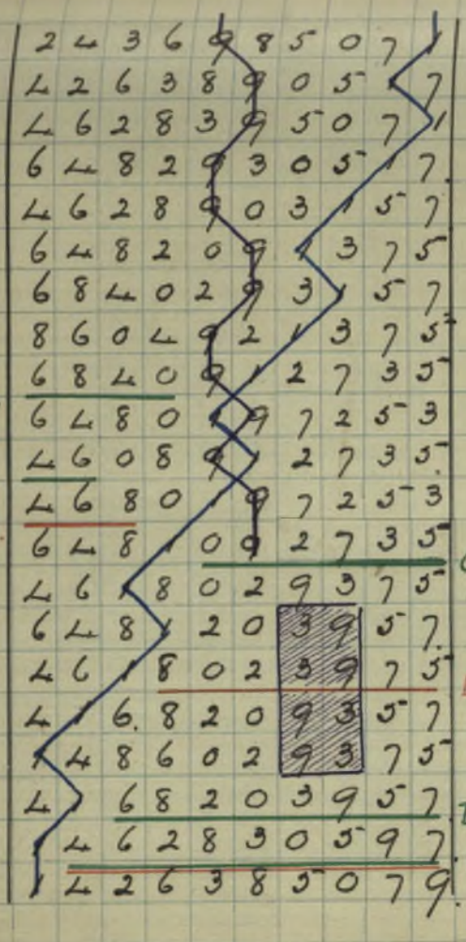
EPINOY. MAJOR.

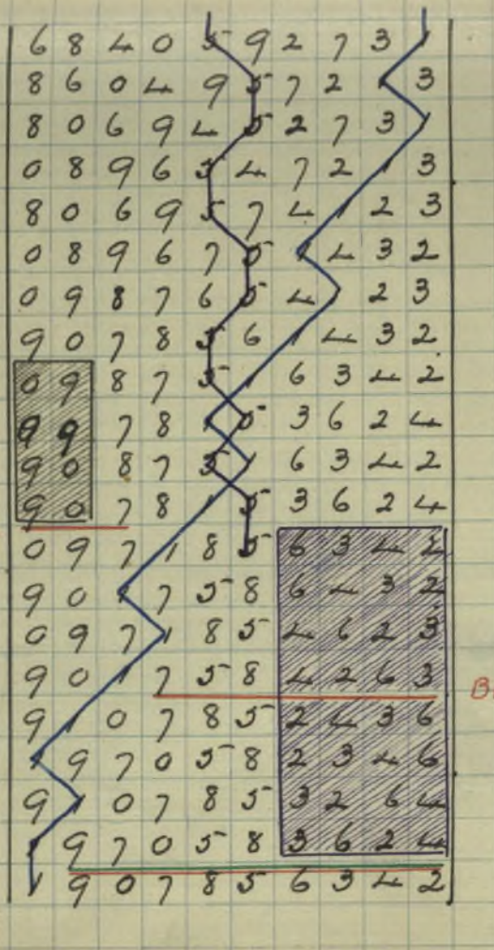





A1. P.Court.
A1. R.Court.
B1. P.Court.
A2.
A2
B2.


A1
A2.


C2.
D2
B2.
C1. P.Court.
B1. R.Court.
D1. P.Court.
Extreme


B2.
B1

218.a

The B Slow Work Bell is the Bell which in the Principle, is the bell immediately next before the Treble in Counting Order. This bell becomes a Hunt, and makes a cyclical path through the Counting Order of the other bells; but it does not change positions in C.O. with the Treble. The result is that the Counting Order of the Principle is altered by the positions of the Treble and Slow Work Bell being reversed. The Treble makes one step forward in its cyclical path in Counting Order.

If the Counting Order of the bells is 5 3 1 2. etc, and 5 is made a B Slow Work bell (not completing its cyclical path so far as 1-2-3 are concerned), the Counting Order will be altered to 3 1 2 5. A further Stunt on 325 will produce the Counting Order 5 1 3 2. The whole operation produces one step forward in Counting Order by the Treble; and is therefore a Constructional Stunt.

We saw, in the case of the Slow Work Stunts, that the Plain or Treble Bob Path of the Treble may be the result of two movements one + and one − The following is a further Example of this. In it the movements are all completed within the Lead and therefore take no part in the Constructional Stunts.

A. is a Block produced by Stunts and Extreme Bells. 4-5 are the Stunts 1-2-3-6-7-8 are the Extreme Bells. *

B. is the same as A, with Jam Dodging Movements inserted to give the Treble an unbroken Treble Bob Path.

C is the Same as B. with the addition of
(a) Four Additional Stunts

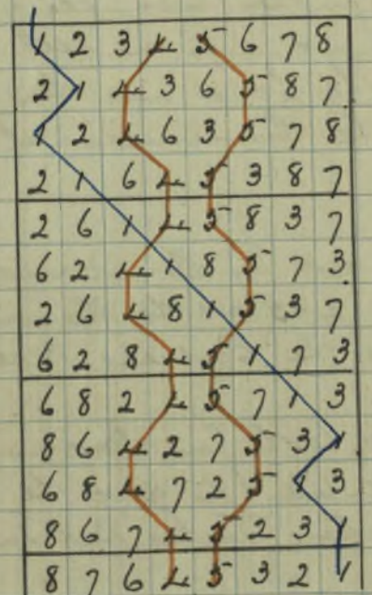
5 3 8 7		5 3 8 7	and
3 5 7 8	instead	5 8 3 7	three
5 3 8 7	of	8 5 7 3	others
5 8 3 7		5 8 3 7.	similar

(b) One Additional Stunt on 4-5.

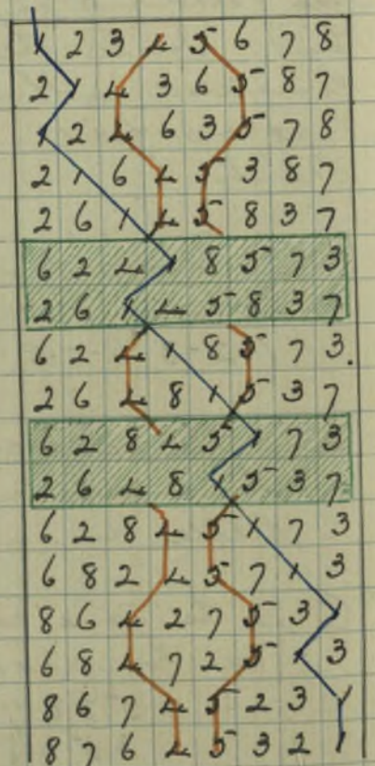
E. is C with five Extremes added.

* See page 134.

A.



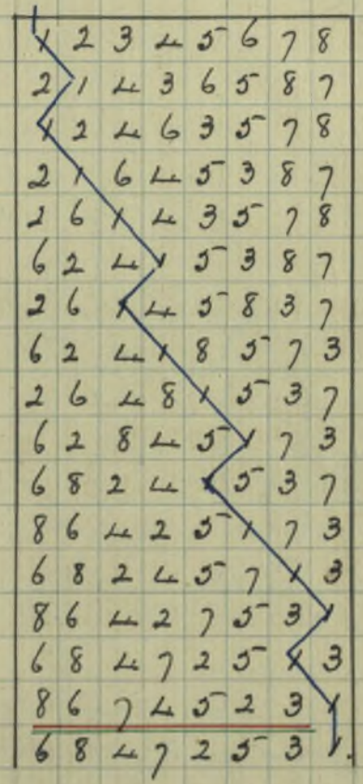
B



C.

D

SUPERLATIVE. 8 MAJOR.



Two points must be noted about all Shunts

1. It is not possible to tell from one Change alone to what Shunt or kind of Shunt the movement in that Change belongs

1	2	3	4	5	6	7	8
2	1	3	5	4	7	6	8
	2	5	3	7	4	8	6
2	1	5	7	3	8	4	6

The movement in the first Change may be part of a Round Block on 3,4,5,6,7,8. It may be part of a H.S. Court Shunt; or it may be part of a Combination of Additional Shunts. It is only when we discover how the cycle (or cycles) is completed that we can state the constructional value of the movement.

2. Two or more different sets of cyclical movements may produce the same Rows.

In certain cases a Slow Work Shunt produces the same Rows as an Extreme, as for instance a 6 Bell Slow Work Shunt

When there are seven Extreme Bells. The Constructions however are really distinct and not merely two names for the same thing.

Chapter XI

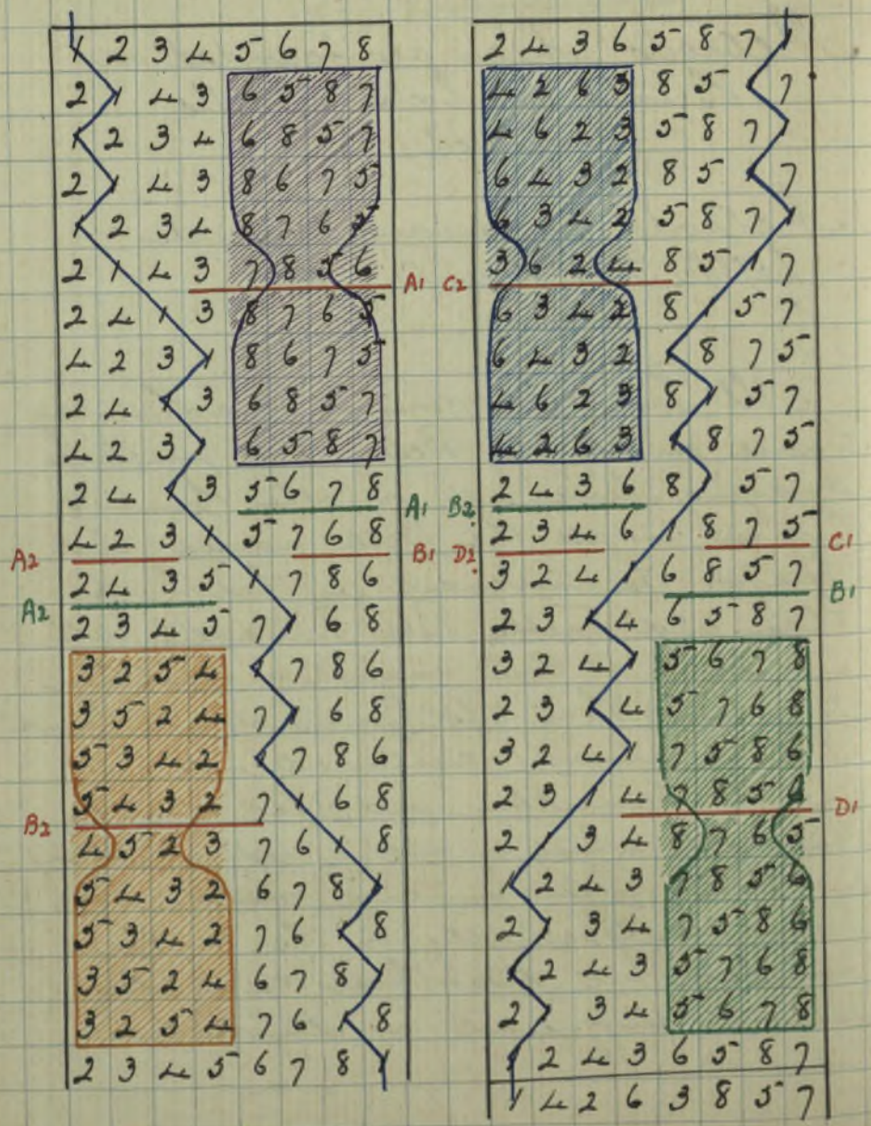
Methods which are founded on Hunts and Extreme Bells. (continued)

Methods on various Principles; Little Bob Hunts; etc.

All Principles consist of a Hunting Course on all the Bells, with sometimes Dodging Movements or other Hunting Courses on all the Bells added, and therefore the movement is that of the Plain and Treble Bob Principles, with a greater or less amount of repetition. It follows that the Constructional Hunts I have already explained will run on all Principles and that none is possible which is not a reduplication of those. An immense variety is possible especially on the higher numbers, but five or three examples will be sufficient as illustrations.

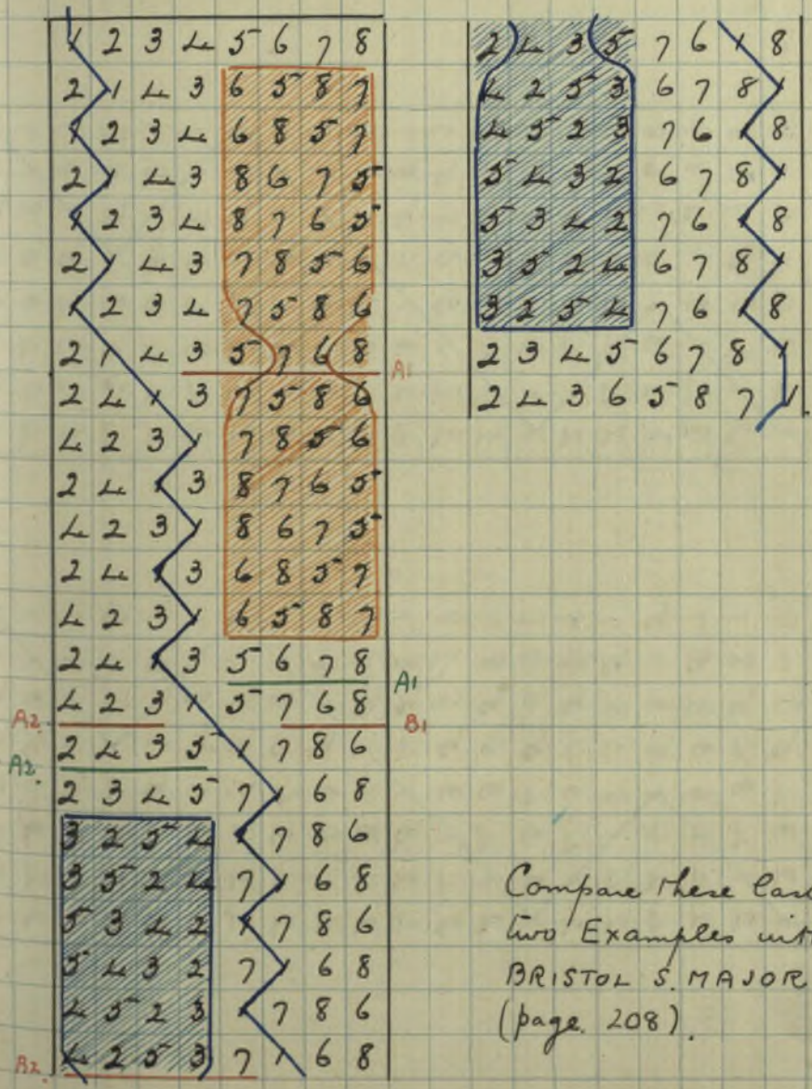
DOUBLE DODGING PRINCIPLE.

FOUR R. COURT. TWO P. COURT CONSTRUCTIONAL SHUNTS.



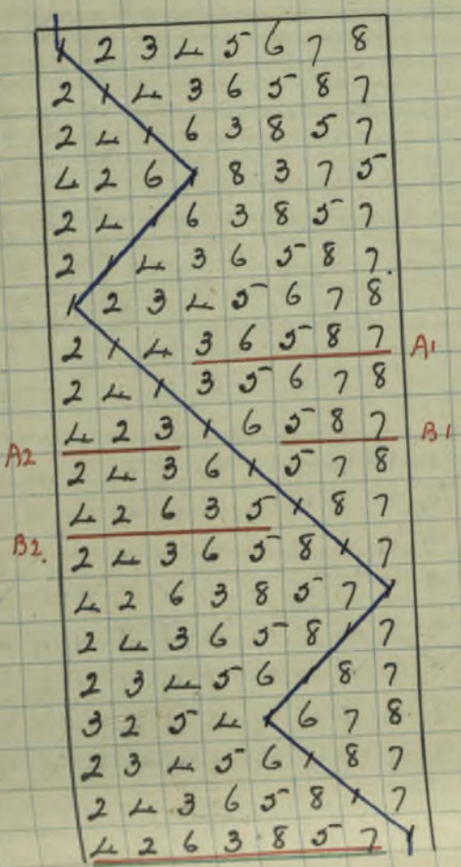
TRIPLE DODGING PRINCIPLE.

FOUR R. COURT TWO P. COURT CONSTRUCTIONAL SHUNTS.

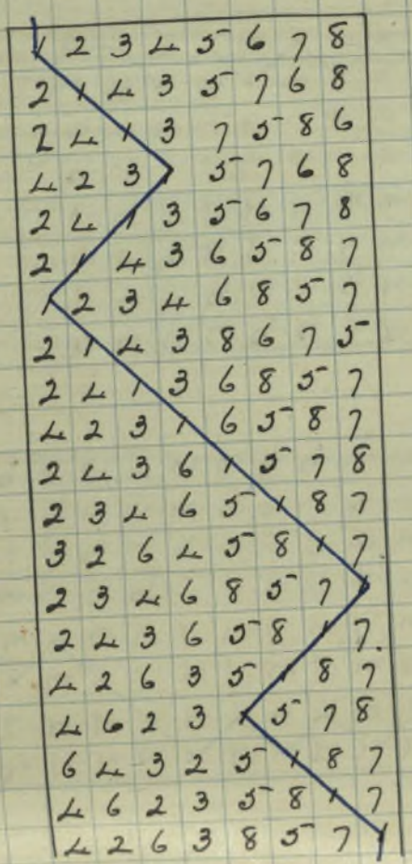


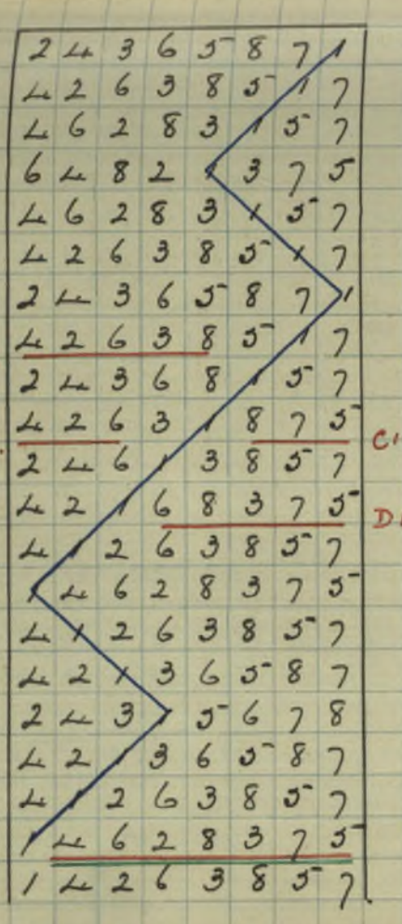
Compare these last two Examples with BRISTOL S. MAJOR (page 208).

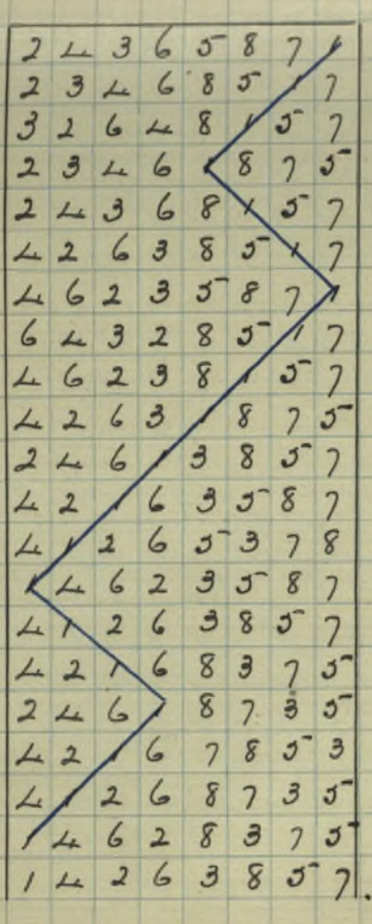
GIANT HUNT PRINCIPLE.
4 R. COURT 2 EXTREME SHUNTS.



NORTHALLERTON MAJOR.

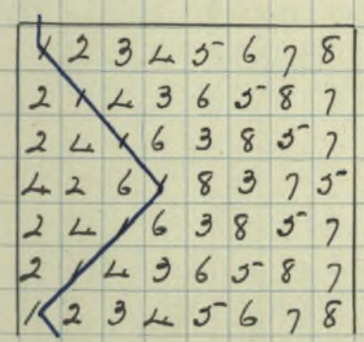


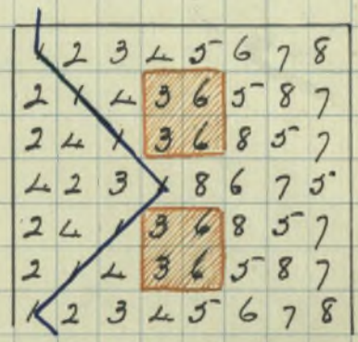




The Additional Shunts of NORTHALLERTON MAJOR are.

1. a 2 BELL Shunt on 3-6.





2. The first steps of Forward movement and four steps of Backward movement of 5-6-7-8 are arranged in a different order.

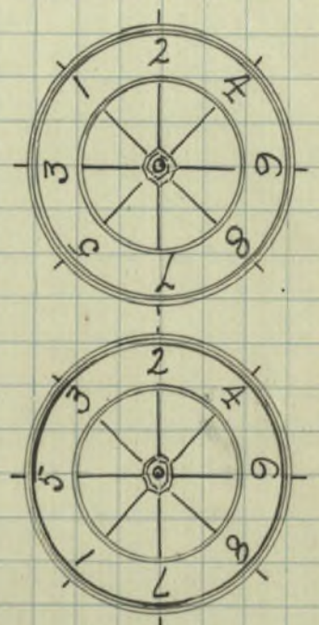
5 6 7 8 ← Backward
5 7 6 8 ← do
7 5 8 6 ← Forward.
5 7 6 8 ← do
5 6 7 8 ← do
6 5 8 7 ← do
6 8 5 7 ← do
8 6 7 5 ← Backward.
6 8 5 7 ← do
6 5 8 7.

Instead of.

5 6 7 8 ← Forward
6 5 8 7 ← do
6 8 5 7 ← do
8 6 7 5 ← Backward.
6 8 5 7 ← do
6 5 8 7 ← do
5 6 7 8 ← Forward.
6 5 8 7 ← Backward
5 6 7 8 ← Forward.
6 5 8 7

The Little Bob Hunts. If in any change of a Principle where the movement is forward, a number of the Bells make one step backward, a secondary cycle is begun, part of the Bells being Hunts and the rest Extreme Bells.

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
6	8	4	7	2	1	3	5
8	6	7	4	1	2	5	3
8	7	6	1	4	5	2	3
7	8	1	6	5	4	3	2
7	1	8	5	6	3	4	2
1	7	5	8	3	6	2	4



In this example 2 4 6 8 7 are Hunts and 1 3 5 Extreme Bells. The Coursing Order of the Extreme Bells is (5, 1, 3) and

The result of the stunt is that the Hunts are put one position forward in Causing Order. from between 1 and 3 to between 3 and 1. i.e. 1 and the Hunts 2-4-6-8-7 have changed positions in Causing Order.

The movement thus begun could be completed by the Hunts finishing their cyclical path and changing positions with 1, 3 and 5 in turn.

But there is an alternative way of considering this stunt. 1 has changed positions with 2-4-6-8-7; it has therefore made five steps in a cyclical path and, if it completes the cycle, the bells will return to the Row from which they started.

The cycle may be completed by other similar stunts, or by a combination of these stunts and other Constitutional Stunts.

The Little Bob Stunt consists of the Hunt (or Hunts) making a Place in its upward path and returning to the Lead without going behind. The result is that it is put backward in Causing Order as many positions

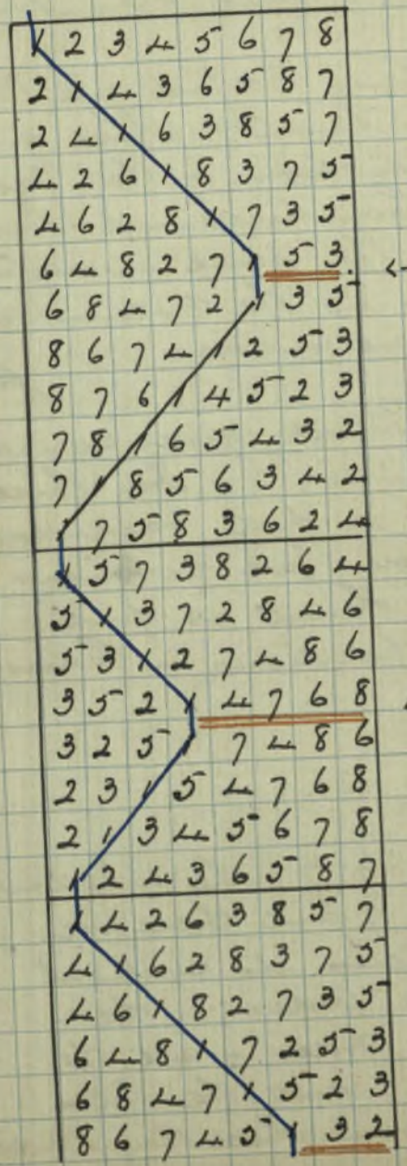
as there are bells below it when it makes the Place.

The Slow Bell in Oxford and Kent is a form of this Hunt; which gives one more illustration of the fact that all these Constructional Hunts are essentially the same in nature, and differ only in the circumstances in which they are made.

The following Block gives examples of Little Bob Hunts. In three cases the Hunt is put backward in Counting Order two positions; in two cases the Hunt is put backward three positions in Counting Order.

$$(3\times5)+(3\times2) = 21.$$

21 is a multiple of 7, the number of Extreme Bells; and therefore the Hunt completes its cyclical path in Counting Order; the original Counting Order of all the bells is regained; and the bells return to the Row from which they started.



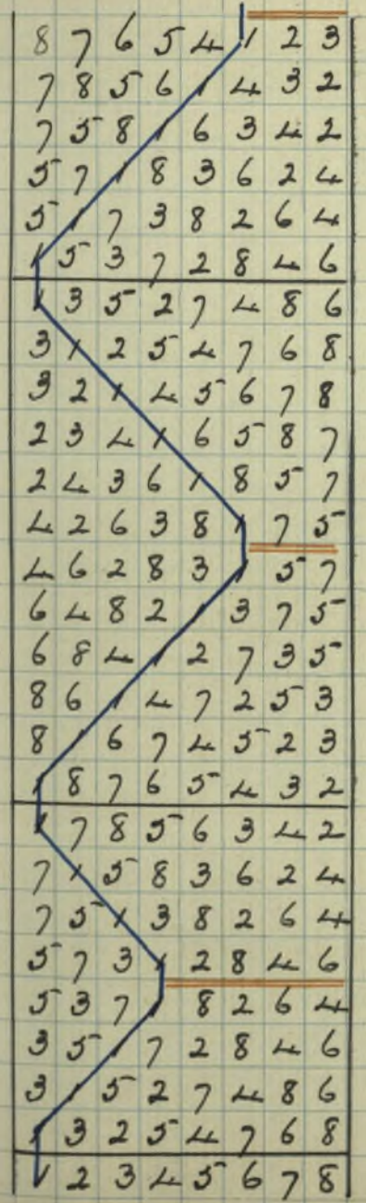
3 1 2 4 6 8 7 5

← The Hunt is put 5 positions backward in C.O.

3 2 4 6 8 7 1 5.

← The Hunt is put 3 positions backward in C.O.

3 2 1 4 6 8 7 5.



← The Hunt is put 5 positions backward in C.O.

3 2 4 6 8 7 5 1

← The Hunt is put 5 positions backward in C.O.

3 2 4 6 8 1 7 5.

← The Hunt is put 3 positions backward in C.O.

A similar result is got if the Hunt makes a Place in its downward path and returns to behind without going to the front.

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
4	6	2	8	1	7	3	5
6	4	8	2	7	1	5	3
6	8	4	7	2	5	1	3
8	6	7	4	5	2	3	1
8	7	6	5	4	3	2	1
7	8	5	6	3	4	1	2
7	5	8	3	6	1	4	2
5	7	3	8	1	6	2	4
7	5	8	3	1	2	6	4
5	7	3	8	2	1	4	6
5	3	7	2	8	4	1	6
3	5	2	7	4	8	6	1
3	2	5	4	7	6	8	1
2	3	4	5	6	7	1	8
2	4	3	6	5	1	7	8.

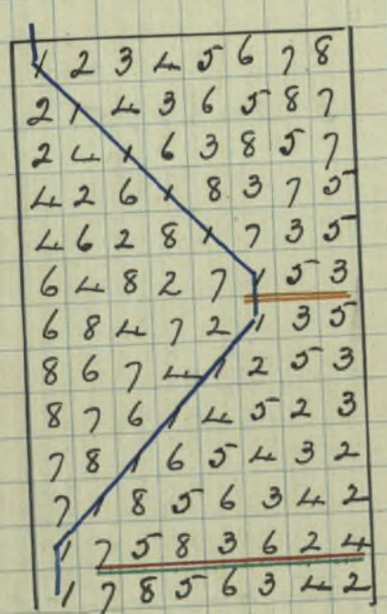
3 1 2 4 6 8 7 5.

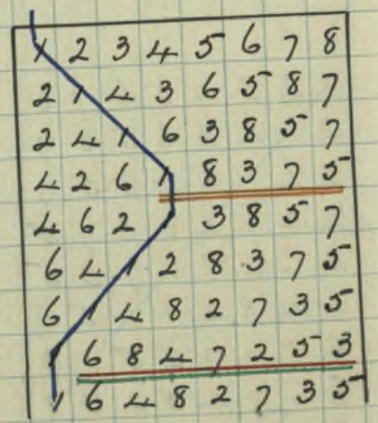
← The Hunt is put 3 positions backward in Coursing Order.

3 2 4 6 1 8 7 5.

PLAIN PRINCIPLE.

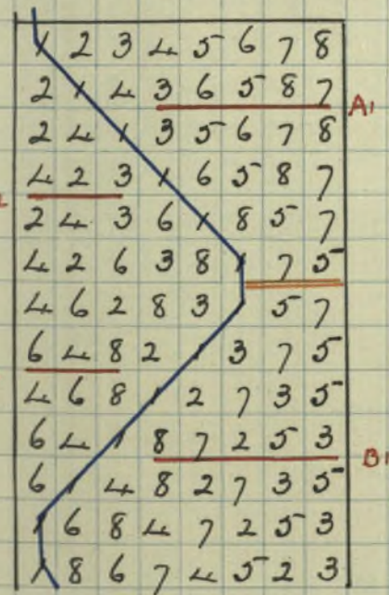
LITTLE BOB. SHUNT AND EXTREME





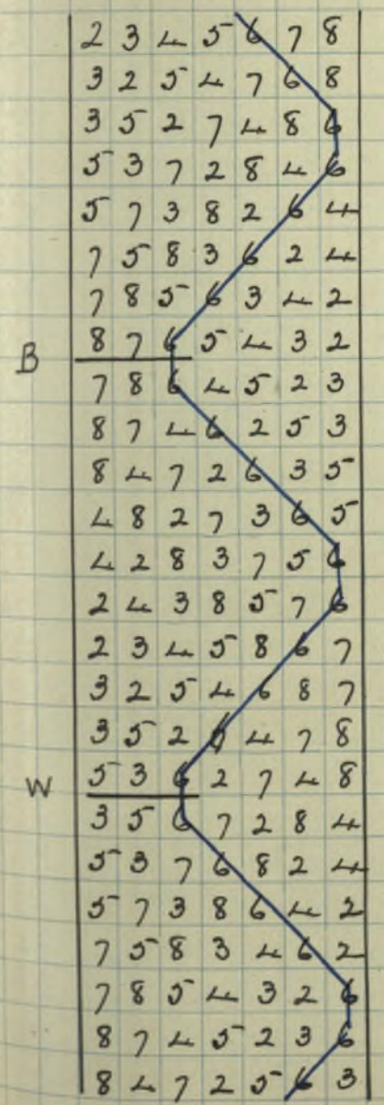
PLAIN PRINCIPLE.

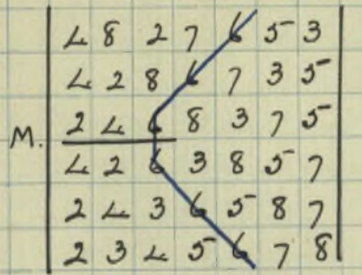
LITTLE BOB SHUNT
TWO R. COURT SHUNTS.



T.B. PRINCIPLE.

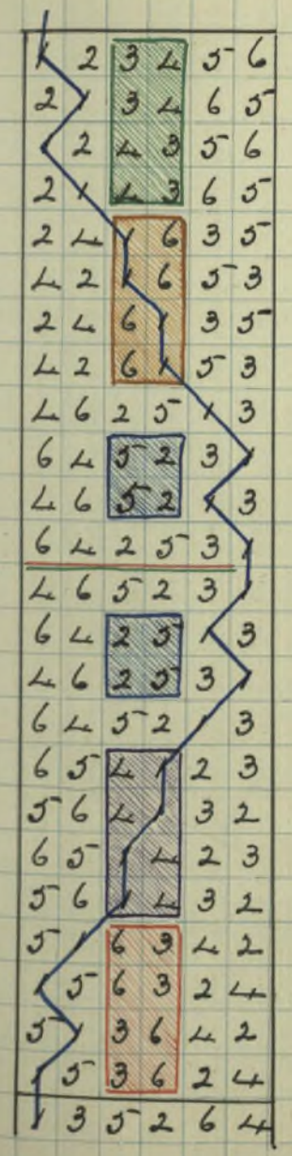
LITTLE BOB. SHUNT.
EXTREME
2-BELL ADDITIONAL SHUNTS.





Compare the work of the Sixth in the familiar touch of Bob Major (B.W.M.) with the Hunt in a Little Bob Shunt.

Also the work of the Second in M.B.W of Kent or London.



Ex.

In the case of ordinary Plain and Treble Bob Methods in which the Treble preserves its plain or dodging hunting unentwined throughout, all Additional Shunts are made on the Extreme Bells only. Additional Shunts can be made so as to involve the Treble as well as the Extreme Bells.

The adjoining Example is on the Treble Bob Principle

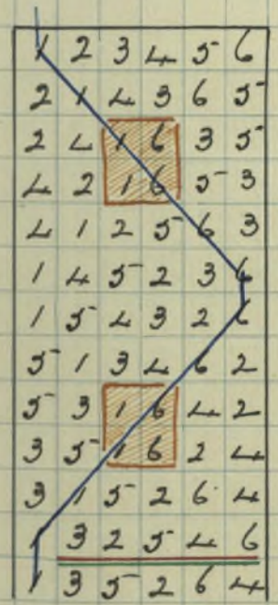
The Consecutional Shunt is the Extreme when the Treble is behind.

There are also six Additional Shunts, each on six bells, in six of which the Treble is involved.

Similarly very many other Methods may be had with the Trebles path more or less irregular.

All Group I. Methods (see

Chaplin VI can be turned into Group II Methods by making Constinctional Shuntis; the Course in the first case becoming the Lead in the second case.



It is possible by using Additional Shuntis to put another bell temporarily into the position of the Hunt. So far as the main Construction is concerned the work of the Hunt will be done for the time by the Bell which is temporarily in its position

Bobs and Singles, and all Special Calls are Shuntis (similar in nature to Additional Shuntis) which are begun in one Course and completed in one or more other Course.

The sum of the whole matter is that every possible block of Rows on all

numbers of Bells must be, the result of a number of distinct complete Cyclical movements.

Some of these Movements will be shared in by all the Bells, and during them the same Causing Order is kept.

Others will be made by part of the bells only, in which case we have the Construction Consisting of Hunts and Extreme Bells.

Irregular Blocks, written down haphazardly and without any apparent design, will conform to this Law equally with those divided into equal Leads and Courses. The difference is merely a question of the more or less symmetrical arrangement of the different Movements.

Since Ringing is essentially Movement of the Bells to understand the Construction of any Method, or Peal, or Block, it is necessary to find out the various Cyclical Movements that produce that Method, Peal, or Block.

The same Rows may be produced by two or more distinct combinations of Movements.

Chapter XII

Standards of Excellence.

At the moment that Ringing began by "two bells pealing into each others place", the Art was definitely fixed in its essential nature, in its scope, and in its limitations. It required only a process of evolution to produce everything it is capable of. No more rules and no imported "Conventions" are needed to give Change Ringing. The Cyclical movement, which is the result of this simple fundamental idea, implies and involves every essential rule except that of non Repetition of Rows.

But ringers quickly found out that some methods of ringing are better than others. Better, that is, from the point of view of the ringers themselves. And so gradually, certain methods were marked out among the rest as those which are best suited for practical ringing These Standard

Methods are the survival of the fittest, and are the result of a process that took quite a long time. This is not the place to try and trace why these Methods should be esteemed more than others. The fact is so. And not only so, but the Exercise has increasingly confined itself to Methods which share certain well defined characteristics of these Standard Methods. Thus, first the old Plain Changes were dropped, then such Cross Peals as did not divide into Leads and Courses, then such of the latter as did not still closely adhere to the standard.

The result is that there has grown up first a number of Rules which the general experience of the Exercise says should be observed in all Methods that are practised; and second a number of standards which although not held to be absolutely essential to a Method, are yet held to be the things that mark the best Methods.

The Rules are as follows:-

1. In Group I Methods, the Plain

Course should be divided into as many Divisions as there are Bells; the work within the Divisions to be the same in each case.

In Group II Methods, the Plain Course should be divided into as many Leads as there are Working Bells, the work in all the Leads to be exactly alike.

2. Each Division in Group I Methods to be symmetrical about a line drawn midway between Division Head and End.

Each Lead in Group II Methods to be symmetrical about a line drawn midway between Lead Head and Lead End.

3. No Bell to lie more than five consecutive blows in any one position.

4. In any plain Course of Group II Methods, the Working Bells to be in the same Coursing Order at every Lead Head and End.

These are Rules which the general

experience of the Exercise has adopted, but it is well that we should not misunderstand their value and position. They have not been imposed by any central authority, the Central Council for instance. They are not essentially destructive rules, as so many of the rules of sport are. There is no analogy between them and, say, the rule in Cricket that the bowler may not throw. The reason for this latter is to preserve due balance between bowler and batsman, and the man who breaks it is guilty of unfairness. It is part of the competitive nature of sport. But Competition enters little into ringing as such, and we require no rules to regulate it. A band may break any of these Rules without any suspicion of unfairness or of doing anything which is not perfectly within their rights. As I have already said, there is no rule in Ringing which you may not freely break* if the result justifies it. But, and this is the whole point, the general experience of the Exercise warns you that, if you want to get the best out of ringing, you

Except that you may not have repetition of Rows. Even this applies, I think, only to Peals. Personally I have no hesitations in calling false short touches

had better keep within them.

The one Rule which may be said to be restrictive and which may not in any case be broken is the Law of Truth.*

None of these Rules is arbitrary or capricious. Each is based on an important truth which lies at the foundation of ringing. All have a definite constructive value, and lay stress on some feature which men value in ringing.

I have already briefly noticed the Rules of Symmetry and Division into Leads.

The rule that a bell may not lie more than two consecutive blows in any one position is a practical recognition of the fact that movement is the one essential thing in ringing. We saw that in theory a bell may lie quite a large number of consecutive blows in any one position, and at the same time share movement equally with the rest of the bells. But this, though perfectly true, is just a little difficult to realise, and we can easily understand why in practical ringing the Exercise rejects it as

* The Law of Truth and all the important and interesting problems which belong to it lie outside the scope of this present enquiry.

being contrary to the idea of movement. Some men have tried to justify this and other rules on musical grounds. I do not think that music has had very much to do with settling any of the main rules of ringing. In selecting touches and peals for performance, men no doubt, of late years, have been guided by musical considerations to a large extent. But if we investigate the things which have from the first, and always, made up the interest in ringing, I do not think we should find music very prominent among them.

The fourth rule is that which says that Methods should have what are commonly known as Bob Major Lead Ends. Nothing in theoretic ringing has been more fully debated than this rule. Nothing has been more utterly misunderstood on both sides. It does indeed seem unreasonable and absurd, at first sight, to say that all Methods should have the same Lead Ends.

⊕ "Bell News" March. 1914.

Sir Arthur Heywood expressed himself as "patiently amused at earnest endeavours to shackle composition into conformity with quite arbitrary and wholly questionable axiomatic rules."⊕ Mr C.D.P. Davies in addition to speeches at the Central Council and long articles in the Bell news has published a pamphlet to show that these Lead Ends are not only not superior but are even inferior to other Lead Ends.* And yet all the new Methods of late years, and nearly all the Methods from the beginning that have been rung, have these Bob Major Lead Ends.

The above eminent gentlemen, and the majority of other people, have quite misunderstood what is the Constructional value of Lead Ends. They assume that a Lead is a certain amount of work the Initial result of which is to produce the Lead End. If the Lead End will repeat the required number of times you have a Course. If not, you have not a Course. Everything depends on

* "Lead Ends" by Rev C.D.P. DAVIES M.A. F.R.A.S. 1918.

whether the Lead End will repeat the required number of times, and therefore any Lead End that will do so is of equal value.

But we have seen that the number of Leads in a Course does not depend in any way on the particular Lead End. It depends entirely on the number of steps made by the Hunt in its Cyclical path through the Causing Order of the Extreme Bells. The Lead Ends need not be in a progression at all, though if every Lead is alike they will be so. Only Constitutional Shunts (i.e. the Hunts Cyclical path in Causing Order) have to do with the number of Leads and the length of the Course. Additional Shunts do not affect those things. But Constitutional Shunts leave the Extreme bells in the same Causing Order and therefore produce Bob Major Lead Ends. If an Additional Shunt is made partly in one Lead and partly in another the Bob Major Lead Ends are hidden, but they remain the

"natural" Lead Ends of all Methods.
It does not seem at all clear why
Additional Shunts should always
be made entirely within a Lead, and
why the natural Lead Ends should
not be hidden. But the general
Experience of the Exercise is pretty
definite on the point, and we take
here a real practical, if unconscious,
recognition of the fact that all
Construction Consists of the Cyclical
path of Hunts, which keep their own
Coursing Order, through Extreme Bells
which keep their own Coursing Order.

Some men hold the opinion that it
should be a Rule that only those
Methods are legitimate which have the
minimum number of Places and Consequently
the regular succession of the nature
of the Rows (odd and even). There is
a good deal to be said for this opinion
but directly we hung it to the only
really important Test, it is shown
to be fallacious. Does the general
experience of the Exercise show that
such a Rule would be good or bad

in working? There is no doubt what ever of the answer. Kent, Cambridge, London, and Bristol break the Rule, and the Exercise cannot afford to lose them, or to have a Rule which forms of the ten Standard Methods sets at naught. Some men would make this Rule operative for odd bell Methods only, mainly because they call them Doubles, Triples, Caters, and Cinques. You can't have a Triples Method, they say, unless your Changes are all triple changes. This does not seem a very convincing argument. It makes the name of the thing more important than the thing itself. At the same time the Exercise has never taken kindly to any odd bell Method which breaks this Rule.

There are other Standards by which men judge Methods, many of them important, all of them interesting, but they need not detain us here, since our object is not to show what is a good Method, but to explain the

laws of construction of all methods.
These Rules and Standards are important
and have value but their value is
entirely selective. They have nothing
to do with the construction of methods;
they differentiate between methods
of different values from a practical
point of view.

Chapter XIII

The Extension of Methods

Of all outstanding problems of the Science of Ringing none has aroused greater interest than that of Extension. The Exercise has made up its mind definitely as to what are the correct extensions of many of the Methods in general use, but the correct ten and twelve bell variations of such Methods as London, and Bristol, Surprise Major, and indeed whether such variations are possible, are still an open question. Double Norwich and Superlative Major have traditional extensions, but they are not accepted as correct by all. Many men, most of them of ability and knowledge, have set themselves to supply these extensions, but it is remarkable and significant that, though each man backs his version with copious arguments, the results are almost always different. And, as they all work on pretty much the

same lines, we shall not be far wrong if we come to the conclusion that the problem of Extension as a whole has not properly been understood.

Plungers found no difficulty in getting the correct extensions of the early simple methods. Grier Plain Bob Minor, Plain Bob Major Royal and Maximus are quite obvious. So too are Plain Bob Duples, Caters, and Cinques. Grandsire, Kent, Oxford, and Stedman extend equally easily. No detailed arguments are necessary to show that these extensions are correct; they pass the only really vital test — the experience of the ringer in the tower.

In addition to the above there are a few other methods the correct extensions of which are not in dispute. These are Original, Duffield, Forward, Double Oxford, and Cambridge Surprise, and the whole serve as models of what a correct extension should be. Men do fully recognise this, but, unfortunately, directly you come to methods outside this group, you have no longer any

obvious and unmistakable extensions, even in cases where the construction of the method is quite simple and obvious. Double Court Minor is almost as simple in construction as Plain Bob Minor, and quite as simple as Kent Treble Bob Minor. In early days it was one of the most popular six bell methods. Naturally ringers tried to extend it to eight bells, but almost every band which rang Court Bob Major rang a different version. Peals were rung in at least three quite distinct methods and each was rung as simply Court Bob Major. Two of these methods became popular, and the Exercise avoided confusion by treating them, not as extensions, but as flesh and distinct methods and calling them after the places where they were first practised - Norwich Court Bob and London Court Bob.*

Interest in Extensions seems then to have died out. The Exercise had quite as many methods as it had any practical use for, and the general opinion grew up that outside the

* See The Clavis"

* Duffied. Sir A. P. Heywood. p. 5.

group of Methods I have mentioned, there can be no such thing as real Extension. This was probably the opinion of the Exercise for a hundred and fifty years down to the end of the nineteenth Century.*

Two notable exceptions there were. The one really original contribution that Shipway made to the science of ringing, was to show the relationship between different variations of a Method. He gave the Single, Double, and Reverse variations of most of the Methods then in use. He showed how any even bell Method on the Plain Principle can be turned into an odd bell Method by adding a bell in the Hunt. And in the Cases of Double Oxford and Superlative he attempted a true extension of a Method on 6, 8 and 10 bells. Unlike other men, his work was not experimental. He worked on a general principle and his conclusions are thoroughly sound.

In the North a band discovered that an apparently complex Method. like Cambridge Surprise could be extended as readily

as Plain Bob or Kent. Whether as the resulting experiment, or of Logical deduction, there is no means of knowing.

Neither of these Cases had any effect on the general opinion of the Exercise. The figures of the Cambridge Royal were not published in any ringing book and were virtually Lost. And the Exercise did not grasp or understand Shipways investigations

This was the State of opinion in the closing years of the nineteenth Century when the advance of practical ringing revived a keen interest in Method Construction. New Methods were produced on all hands, and the question of Extension became again a live one. Even then it was felt that Composers showed far more zeal than knowledge, and the real idea at the bottom of the appointment of the Method Committee was an attempt to devise some means of curbing their exuberance.

Why then should try and get extensions of popular Methods so easily understood. There is a prestige belonging to a Method like London Surprise, which no new

one can ever possess. Every one would admit that a peal of London Surprise Royal is an outstanding performance. A peal in the same method under another name would pass almost unnoticed.

But in trying to produce these Extensions Composers had little knowledge to guide them. They had the simple methods as models, but they did little more than show, apparently, that extension of a complex method like London, or Superlative, or Bristol is a different thing altogether to extension of Plain Bob or Stedman or Kent. Composers were therefore reduced to working by experiment. They took an eight bell method, analysed it, found what they considered its important features, and then tried to reproduce them as nearly as possible on ten bells. Of course they were prepared to justify their results by much argument. They could give abundant reasons for everything in their extensions. But it is quite fair, I think, to say that in all cases

the figures were got first, and the arguments afterwards.

The proof of a pudding is in the eating. Not only has the experimental method of working failed to show how Methods has a right to extend; it has utterly failed to produce one undisputed extension of any single Method. In the case of London each Composer who has tried to extend the Method, has produced a different version, most of them have produced more than one. And each version has in its turn been given to us as the one and only correct London Surprise Royal.

The experimental method of working stands then condemned, and we must find out some general law based on the essential nature of ringing, and therefore applicable to all Methods, or failing this, we must come to the conclusion that, outside the few Methods I have mentioned, there is no such thing at all as Extension.

Inside the Methods Committee one or two attempts were made to find such a law. The attempts failed because they were based on the assumption

that Places are the important things in Method Construction, and that all else depends on them. Thus, we argued that Plain Bob Minor is produced from the Plain Principle by moving inward an External Place. Plain Bob Triples is produced by adding two fresh Places. Therefore they are not the same Method. But the general experience of the Exercise and the individual experience of all of us in the Tower, is that they are the same Method; and the one a fine extension of the other. Places we saw are not the one essential thing in a Method, and we must look elsewhere for the basis of our Law.

In trying to settle the question of Extension, two questions must be answered at the outset —

1. What, exactly, is it that you are going to extend?
2. What, exactly, do you mean by extension.

1. What is a Method? Probably no

term in ringing is, for all practical purposes, less ambiguous, or less liable to be misunderstood than the term Method. It hardly needs a definition. But when we come to a question like the one before us, we must have something much more definite and exact than "will serve for all practical purposes". A Method is not a collection of figures or symbols. It is not an arrangement of Places. It is not a collection of Rows. It is not a particular relationship between a number of Rows. It implies all these things, but essentially it is what its name states a "method of ringing Changes." It is so much work, so much turning, dodging, and place making. It is so much movement of the bells. You may express this in mathematical or philosophical terms, but for all purposes of the Science, as well as the art, of Change ringing a Method is nothing else than so much movement. As I have pointed ringing is essentially movement, and movement which must be cyclical in.

in form.

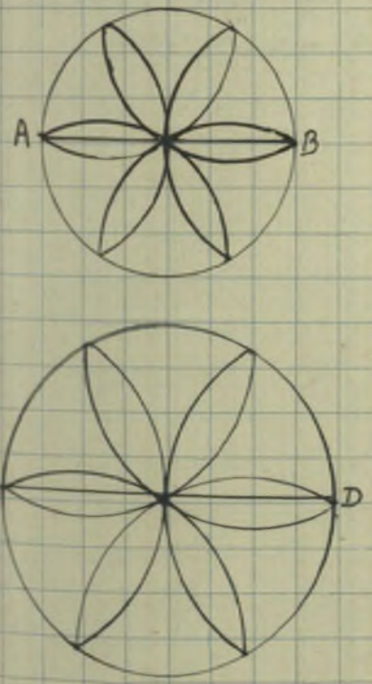
Therefore what you have to extend is, not a group of figures; not an arrangement of Places; not a collection of Rows; but a series of cyclical movements. And it can hardly be denied that if you can do this, you will have produced just what the practical engineer asks for.

2. What do you mean by Extension? Most men answer this something in this way. In extending a method they say you take it on one number of Cells and reproduce the same thing on a larger number. They assume that an extension differs from its original only in scale.

But this is what can never happen. You cannot treat two Rows like 12345-6 and 12345-678 as if they were two lines of different length. If you have two lines AB and CD of different length; and if on AB you erect any geometrical figure, you can project that figure on to CD. The figure on CD will be exactly similar

A ——————— B
C ——————————— D

so that on A.B. except that it will be on a larger scale. But you cannot do a similar thing with two Rows of unequal length. The reason is that a line is made up of an <u>infinity</u> of points, but a Row is made up of a <u>definite</u> number of Bells. Any line can be divided in any proportion, and therefore any two lines can be divided in the same proportion. But no two Rows of unequal length can ever be divided in exactly the same proportion. You cannot divide a Row which has seven Extreme Bells in the same proportion you can a Row with five Extreme Bells. You could divide into two equal halves, both a row containing eight bells and one containing ten bells; but since the half of one contains an even number of bells, and the half of the other an



odd number of bells the division is not really proportionate.

In Stedman Doubles the Slow Work* occupies 3/5 of the whole space; in Stedman Triples it occupies 3/7 ths; in Stedman Cinques 3/11 ths. The result is, that the work of the bells differs in many respects. In Doubles a bell runs straight through from back to front, and from front to back; it does not do so on any other number. Similarly there are ways in which the feature of Kent Major differs from Kent Minor. You can never get exactly the same thing on a higher number that you do on a smaller number. This is true of the simplest Methods, and quite obvious of the more Complex Methods.

Some Composers, recognising this, say that Extension means getting the nearest possible result on a higher number. But that won't do. It is altogether too haphazard. What one man might consider the nearest possible, another man would probably totally dispute. If there is such a

* i.e. the 3-Bell Work in the Front which of Course also includes the Quick Bells

thing as extension at all, there must be a definite mathematical relationship between the different variations. You must be able to say definitely, and without qualification, that such and such is an extension and such and such is not.

Take Rounds on all possible numbers of bells to infinity –

123 – 1234 – 12345 – 123456 – 1234567 →

What is the exact relationship between these Rows? How does 1234 differ from 123? It is not by the addition of anything fresh. Of course in writing out the figures which represent the Row you do add a new figure; and in the tower you add a fresh bell. But so far as the Method is concerned which is the added figure or bell? Not the Treble for the Treble on one number is the equivalent of the Treble on all numbers. Not the Tenor, for the Tenor on one number is the equivalent of the Tenor on all numbers. Equally each individual

bell in the Row 123456 is the equivalent of a bell in the Row 12345.
The only relationship between the Rows which form this series, is that of a mathematical progression, and it follows that if on these Rows, equivalent Methods are constructed, the relationship between them will also be a mathematical progression.

A Method on a given number of Bells is a series of cyclical movements;

The Extension of that Method will a progression of the series of cyclical movements, arranged on a progression of numbers of Bells.

To understand any progression it is necessary to state one term and also the factor of the progression. In Methods the term must be the cyclical movements and nothing else, for these alone are the essential things of ringing. The factor will vary in different circumstances but will be subject to one general law.

Since a progression of cyclical movements is a progression of the one essential thing in a Method, we shall find that it implies and involves a progression of all other Changes of any importance. It implies a progression of the Rows, of the Places, and of all the Work.

1	2	3	4
2	1	4	3
2	4	1	3
4	2	3	1
4	3	2	1
3	4	1	2
3	1	4	2
1	3	2	4
1	2	3	4

1	2	3	4	5
2	1	4	3	5
2	4	1	5	3
4	2	5	1	3
4	5	2	3	1
5	4	3	2	1
5	3	4	1	2
3	5	1	4	2
3	1	5	2	4
1	3	2	5	4
1	2	3	4	5

1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	6	1	5	3
4	6	2	5	1	3
6	4	5	2	3	1
6	5	4	3	2	1
5	6	3	4	1	2
5	3	6	1	4	2
3	5	1	6	2	4
3	1	5	2	6	4
1	3	2	5	4	6
1	2	3	4	5	6

Let 12, 123, 1234, 12345, → be a progression of Rows to infinity. On each Constituent a forward Ringing Course.

Then since —
a. The starting Rows are in progression;
b. There is one Cyclical movement on each Row.
c. The movements are in all cases in the same direction (i.e. forward)
∴ The result is a true Extension

This simple and obvious Extension is the pattern and model of all Extensions just as the all Method Construction is implied in the Hunting Course and is a development of it; so all Extension is implied in the above Example

Notice how everything of importance is equally in progression

Coursing Order —
21 - 2631 - 24531 - 24653-31 - 24635-31 -

Number of Rows —
4 - 6 - 8 - 10 - 12 - 14 - 16 →

Or the Rows themselves. Thus the second Rows are in a progression, —

21. - 213. - 2143 - 21435 - 214365 - 2143657 -

No of Bells.	2.	3	4.	5.	6.
Position of Row	2.	3.	4	5.	6.
Row.	21.	231.	4231.	45231.	645231.

Similarly, each individual Row of any any blokk, or any number, is one of a progression, which runs right through the whole Extension from the Lowest number of Bells (2) to infinity.

And this is a general rule of all Extensions, even of the most complex Methods. Each individual Row, or any number, will be one of a progression that runs through all numbers; though in many cases the progression will not be obvious or easy to see.

The one factor in the above Extension is the difference in the number of bells, and extension takes place equally in all features. Thus the relationship between a Hunting Course of Minor and one of Major is in all features that of 6 to 8. The number of bells, the

number of Rows, the number and size of the Cyclical movements, the Covering Order, the Rows themselves, are all strictly in this proportion.

But directly you introduce any Dodging or Secondary Movements, the Factor can no longer be the simple one of the difference in the numbers of Bells.

1	2	3	4	5	6
2	1	4	3	6	5
1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

Take a Block produced by Treble Bob Hunting.

The main forward cyclical movement extends in a progression 6 in Infinity, the Factor being the difference in the numbers of Bells.

The number of inserted Dodging Movements also expands as the difference in the numbers of Bells.

No of Bells.	4	5	6	7	8	9	10	11	12	13	14
No of Inserted Dodging Movements.	4	5	6	7	8	9	10	11	12	13	14

But the extent of backward and forward movement in each Dodging movement does not extend in the same proportion. On all numbers it is definitely one step backward followed by one step forward.

Of course the total amount of backward and forward movement in the whole Block is increased as the difference in the numbers of bells; but it must be remembered that each Dodging movement is complete in itself, and so not constructionally related to any other Dodging movement.

The result is that, while a series of Treble Bob Courses on 4, 5, 6, 7 → bells are in strict progression, the Divisions into which they are divided extend Longitudinally as the difference in the numbers of Bells; but vertically are constant.

Thus the progression is not a simple one, as in the case of the Hunting Course, but a Compound one; and this fact has a profound influence on the extension of Methods.

Or again, take the following —.

1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	6	1	5	3
2	4	1	6	3	5
2	1	4	3	6	5
1	2	3	4	5	6

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7
4	2	6	1	8	3	7	5
2	4	1	6	3	8	5	7
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8

1	2	3	4	5	6	7	8	9	0
2	1	4	3	6	5	8	7	0	9
2	4	1	6	3	8	5	0	7	9
4	2	6	1	8	3	0	5	9	7
2	4	1	6	3	8	5	0	7	9
2	1	4	3	6	5	8	7	0	9
1	2	3	4	5	6	7	8	9	0

1	2	3	4	5	6	7	8	9	0	E	T
2	1	4	3	6	5	8	7	0	9	T	E
2	4	1	6	3	8	5	0	7	T	9	E
4	2	6	1	8	3	0	5	T	7	E	9
2	4	1	6	3	8	5	0	7	T	9	E
2	1	4	3	6	5	8	7	0	9	T	E
1	2	3	4	5	6	7	8	9	0	E	T

ad inf.

This series is in strict progression, but the difference in the number of bells is the factor of only the rows themselves. The length of the movement, (three steps forward followed by three steps backward), and the number of Rows are constant.

The following is a further compound progression. The difference in the number of bells is the factor of the

of the Rows themselves. The amount of forward and backward Running is in the following progression –

No of Bells.	4.	5	6	7	8	9	10	11	12 →
No of Steps of forward Running followed by same	1	2	3	4	5	6	7	8	9.
No of Steps of backward Running									
No. of Rows.	3	5	7	9	11	13	15	17	19.

1	2	3	4
2	1	4	3
1	2	3	4

1	2	3	4	5
2	1	4	3	5
2	4	1	5	3
2	1	4	3	5
1	2	3	4	5

1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	6	1	5	3
2	4	1	6	3	5
2	1	4	3	6	5
1	2	3	4	5	6

ad. inf.

This establishes the Law that equal expansion can take place only in a single Running Course; and that when Dodging Movements are introduced expansion is unequal, some Features expanding in a different proportion, or remaining constant.

Similarly, expansion in a Block which is constructed by a primary cyclical movement and one or more secondary cycles, is necessarily unequal. Each cycle will expand as the difference in the number of bells*, but as the proportion between the numbers of bells in the primary and the secondary cycles is not constant, but in a progression, the factor of the whole series will be a compound one.

Take the simple example of Plain Bob —.

No of Bells.	4	5	6	7	8	9	10
No of Hunts.	1	1	1	1	1	1	1
No of Extreme Bells.	3	4	5	6	7	8	9
No of Rows in Lead	8	10	12	14	16	18	20
No of Rows in Secondary Cycle.	6	8	10	12	14	16	18
No of Rows in Course.	24.	40.	60.	84.	112.	144.	180.

This is a fine progression, but it is obvious that the factor is not a simple one, and therefore expansion is unequal.

The introduction of other secondary cycles will each bring in a factor of its own, and thus make the progression

* i.e. the number of bells involved in the particular cycle.

still more complex.

The fact that expansion is unequal, and subject to the laws of a true mathematical progression, has been totally overlooked; and this is largely the cause of so much misunderstanding of what extension really is.

One general law arises from the fact that an extension is a true progression, which is, that an extension is not confined to a limited number of bells. It goes on to infinity. Thus, if you have a true extension of London Major to ten bells, you have automatically the true extension to twelve bells and every number that is in the progression 8 10 12 14 16 →

Conversely, if you have what you call a true extension from eight bells to ten, and it will not further extend to 12. 14. 16 etc, then that fact is sufficient proof that the extension is not really a true one, whatever reasons and arguments you may have to think it so.

Further, no one in considering a

mathematical progression and especially a complex one & he would think of confining himself to the first five or three items; and similarly, though for practical purposes we are restricted to twelve bells, and the labour of working out methods on large numbers is very great, still we must take these higher numbers into consideration. In many cases it is only by so doing that we can appreciate what the extension really is.

A. The Extension of Principles

The Plain Principle consists of the Hunting Course and as we have seen expands in a simple progression, the one factor being the difference in the number of bells.

The Treble Bob Principle consists of a Hunting Course with the addition of certain Dodging Movements arranged symmetrically. The Hunting Course expands equally as the difference in the number of bells. The number of the Dodging.

Movements expands in the same ratio. Horizontally each Division expands in the same way; vertically it is constant on all numbers. I.E. it always comprises four changes.

The Double Dodging and Triple Dodging Principles expand in a way similar to the Treble Bob Principle; and the whole form examples of the extension of every symmetrical Principle

On page 274. is an extension of a Principle in the following progression

No of Bells. -	6	8	10	12	14	16	18	
No of Hunting Courses	1	1	1	1	1	1	1	
Inscribed Dodging Movements	1 pull	3 pull	5 pull	7 pull	9 pull	11 pull	13 pull	
No. of Divisions.	6	8	10	12	14	16	18	ad Inf.
No. of Changes in each Division.	4	8	12	16	20	24	28	
No of Changes in Course.	24	64	120	192	280	384	504	

This is a fine progression, and therefore a fine extension. The factor is not a simple one, and therefore expansion is unequal, but there is nothing on any number of

1	2	3	4	5	6
2	1	4	3	6	5
1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8	9	0
2	1	4	3	6	5	8	7	0	9
1	2	3	4	5	6	7	8	9	0
2	1	4	3	6	5	8	7	0	9
1	2	3	4	5	6	7	8	9	0
2	1	4	3	6	5	8	7	0	9
1	2	3	4	5	6	7	8	9	0
2	1	4	3	6	5	8	7	0	9
1	2	3	4	5	6	7	8	9	0
2	1	4	3	6	5	8	7	0	9
1	2	3	4	5	6	7	8	9	0
2	1	4	3	6	5	8	7	0	9
2	4	1	6	3	8	5	0	7	9

ad Inf.

bells which is not the result of the movement on six bells expanded in regular ratio.

All other Principles, including those that are asymmetrical, will extend similarly. In most cases more than one factor is possible, and therefore more than one line extension

B. The Extension of Group I Methods.

The main construction of Group I Methods is that of the Principle on which they are founded, and therefore the main extension is that of the Principle. It is only necessary to consider how the Additional Shunts can extend.

Original being identical with the Hunting Course and having no Additional Shunts expands equally as the difference in the number of bells. This is the only Method of which this can be said.

1	2	3	4	5	6
2	1	3	4	6	5
1	2	4	3	5	6
2	1	4	3	6	5
2	4	1	6	3	5

Group I Subdivision B. Methods have the same Division Heads and Ends as the Principle on which they are founded; and, in addition, they have one or more Hunting Courses, or part of the bells, which are wholly within the Division. Forward is typical of these Methods and we will now see how Forward can extend.

The Principle is the Treble Bob Principle, and extends in a fine progression, as we have seen, but unequally. The Division expands longitudinally, but vertically is constant.

The Additional Hunt is a complete Hunting Course on five bells made in 3-4. What expansion can take place in this Hunting Course?

A Hunting Course can extend equally as the difference in the number of bells involved in it.

The expansion of the Principle has reduplicated the positions represented by 3-4 on five bells.

Therefore, prima facie, there seem to be four possible ways in which the Hunting Course on five bells, made in 3-4 on

six bells, can be reproduced on the higher numbers.

1. That the Hunting Course should expand in regular ratio as the numbers of bells expand.

2. That it should remain constant in size, in number, and position. i.e. as one Hunting Course on five bells, in 3-4, on all numbers.

3. That it should remain constant in size and number; but that its position should be altered in a regular progression.

4. That it should remain constant in size; but that its number should be increased in a regular progression.

1. Can the Hunting Course expand? The answer is easily seen. It cannot. And for the reason that the extension of the Principle leaves the Division the same size vertically. To whatever number you extend it, the Division always consists of no more than four changes. Four changes per pace for a Hunting Course on five bells. If you expand it to three bells you require six changes. To four bells you require

eight changes. And so on. These increased number of changes are not available; and therefore no expansion can take place within the Hunting Course itself.

All this seems, of course, quite obvious and so need no detailed proof, but we have here an important law of extension viz that owing to the expansion of the Principle being unequal, the capacity of the Additional Shunts of expansion is very much restricted.

2. The size, position, and number of the Additional Shunts may remain constant

Exten: A.

1	2	3	4	5	6
2	1	3	4	6	5
1	2	4	3	5	6
2	1	4	3	6	5
2	4	1	6	3	5

1	2	3	4	5	6	7	8
2	1	3	4	6	5	8	7
1	2	4	3	5	6	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8	9	0
2	1	3	4	6	5	8	7	0	9
1	2	4	3	5	6	7	8	9	0
2	1	4	3	6	5	8	7	0	9
2	4	1	6	3	8	5	0	7	9

This is the traditional and obvious extension. It is a fine progression, but it must be noted that the factor is not a simple one, and therefore expansion is unequal. The relative prominence of the places which form the Hunting Course steadily decreases with the increase in the number of bells. On six bells they occupy a third of the whole Course. On eight but a quarter. And if you produce it to a thousand or more bells they occupy but the tiniest fraction. Thus, again, shows a general law of extension. Owing to the unequal expansion the relation between different work will alter in a regular ratio. A work which is very prominent on one number, and perhaps seems to dominate the whole method, will often shrink to insignificance on higher numbers. Thus, because backward hunting seems to be the one prominent feature of London Major, it does not follow that it will be equally prominent when you extend the Method to twelve, fifty, or a hundred bells. Neither does it follow

that because Bristol Surprise Major consists largely of Jam-bell work, that the extension to higher numbers will also consist of Jam-bell work

One further point may be noticed here. Forward Minor is a perfectly double Method, but Forward Major is not, and neither is any other of the same extension. Some extensions of some Methods are double on all numbers, but this is purely accidental. It is not true to say, as some men say, that because the Major of any Method is double, the Royal and the Maximus must also be double. In complex Methods whether a Method is double or not, depends very largely on the symmetrical arrangements of the Additional Shunts. In any extension the position of the Additional Shunts relative to the main Cyclical movements may be retained, but the relative position to Before and Behind (which are comparatively unimportant) may be altered. As in the case with Forward.

3. The size and number of the Additional Shunt may remain Constant but the position may alter in regular ratio.

1	2	3	4	5	6			
2	1	4	3	6	5			
1	2	3	4	5	6			
2	1	4	3	6	5			

1	2	3	4	5	6	7	8	
2	1	4	3	6	5	8	7	
1	2	3	4	5	6	7	8	
2	1	4	3	6	5	8	7	ad. inf.

The relationship between these Changes is that of a progression. It follows that 3-4 on eight bells is not the only equivalent of 3-4 on six bells; 5-6 is equally the equivalent. Neither 3-4 on eight bells alone, nor 5-6 alone, nor 3-4 and 5-6 together is exactly the same thing as 3-4 on six, but all three, equally, are progressions of it.

It follows that the Additional Shunt may be made as follows -

No. Bells.	6	8	10	12	14	16
Position of Shunt	3-4	5-6	7-8	9-10	11-12	13-14

ad inf.

which will give the following Extension

Exten:
B.

1	2	3	4	5	6
2	1	3	4	6	5
1	2	4	3	5	6
2	1	4	3	6	5
2	4	1	6	3	5

1	2	3	4	5	6	7	8
2	1	4	3	5	6	8	7
1	2	3	4	6	5	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8	9	0
2	1	4	3	6	5	7	8	0	9
1	2	3	4	5	6	8	7	9	0
2	1	4	3	6	5	8	7	0	9
2	4	1	6	3	8	5	0	7	9

Again, a further progression is possible. The Additional Shunt on six bells occupies the middle position. There is no middle position on eight bells, but only on the numbers in the following progression —

6, 10, 14, 18, 22, 26 ad inf.

The additional Shunt will be made in the following positions —

3-4 5-6. 7-8. 9-10 11-12 13-14 ad inf.

Exten:
C

1	2	3	4	5	6
2	1	3	4	6	5
1	2	4	3	5	6
2	1	4	3	6	5
2	4	1	6	3	5

1	2	3	4	5	6	7	8	9	0
2	1	4	3	5	6	8	7	0	9
1	2	3	4	6	5	7	8	9	0
2	1	4	3	6	5	8	7	0	9
2	4	1	6	3	8	5	0	7	9

4. The size of the Additional Shunt may remain constant, but the number and positions alter in regular ratio. Not only are 3-4 and 5-6 on eight bells severally the equivalent of 3-4 on six bells, but the two together are the equivalent. This gives us the following Extension.

No of Bells.	6.	8	10
Positions of Add. Shunt.	3-4.	3-4 5-6	3-4. 5-6. 7-8

12.	14.
3-4 5-6. 7-8 9-10	3-4 5-6 7-8 9-10 11-12.

Extension of D.

1	2	3	4	5	6	
2	1	3	4	6	5	
1	2	4	3	5	6	
2	1	4	3	6	5	
2	4	1	6	3	5	

1	2	3	4	5	6	7	8
2	1	3	4	5	6	8	7
1	2	4	3	6	5	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8	9	0
2	1	3	4	5	6	7	8	0	9
1	2	4	3	6	5	8	7	9	0
2	1	4	3	6	5	8	7	0	9
2	4	1	6	3	8	5	0	7	9

Thus we have four distinct Extensions, each of which is a perfect progression. each with a different factor. It will be noticed that each is a progression in all its important features; in the Causing Order, in the Rows, and in the work generally. Each is a true Extension from the strictest point of view of actual ringing; each has one general rule for ringing on all numbers.

A is Treble Bob Hunting except that Places are made when passing through 3-4

B. is Treble Bob Hunting except when passing through the highest dodging position but one.

D. is Treble Bob Hunting in the lowest and highest dodging positions and Place making elsewhere.

C is Treble Bob Hunting except when passing through the middle dodging position.

Musical considerations make A the best Extension, but otherwise they are of equal value.

One further Extension of the Hunts that produce Forward on six bells will

be noticed presently.

I have dealt thus fully with the Extension of Forward Senior because it is a simple example which is thoroughly typical of the Extension of all Methods.

All Group I. Subdivision B. Methods extend in a way similar to Forward.

As Group I Subdivision C Methods are identical in construction to the last class except that the Additional Stunts extend over more than one Division, the extensions will be equally similar

On page 286 is an example of the extension of these Methods. It will be noticed that expansion is unequal, the Additional Stunts remaining constant in size, but in number and position they are reproduced in a regular progression. On page 287 is a table showing how the progression of Stunts results in a progression of all the other important features of the Method

B.

1	2	3	4	5	6	7	8
1	2	3	5	4	6	7	8
1	3	2	4	5	7	6	8
1	3	2	5	4	7	6	8
3	1	5	2	7	4	8	6
3	1	5	7	2	4	8	6
3	5	1	2	7	8	4	6
3	5	1	7	2	8	4	6
5	3	7	1	8	2	6	4
5	3	7	8	1	2	6	4
5	7	3	1	8	6	2	4
5	7	3	8	1	6	2	4
7	5	8	3	6	1	4	2
7	5	8	6	3	1	4	2
7	8	5	3	6	4	1	2
7	8	5	6	3	4	1	2
8	7	6	5	4	3	2	1

1	2	3	4	5	6	7	8	9	0
1	2	3	5	4	7	6	8	9	0
1	3	2	4	5	6	7	9	8	0
1	3	2	5	4	7	6	9	8	0
3	1	5	2	7	4	9	6	0	8
3	1	5	7	2	9	4	6	0	8
3	5	1	2	7	4	9	0	6	8
3	5	1	7	2	9	4	0	6	8
5	3	7	1	9	2	0	4	8	6
5	3	7	9	1	0	2	4	8	6
5	7	3	1	9	2	0	8	4	6
5	7	3	9	1	0	2	8	4	6
7	5	9	3	0	1	8	2	6	4
7	5	9	0	3	8	1	2	6	4
7	9	5	3	0	1	8	6	2	4
7	9	5	0	3	8	1	6	2	4
9	7	0	5	8	3	6	1	4	2
9	7	0	8	5	6	3	1	4	2
9	0	7	5	8	3	6	4	1	2
9	0	7	8	5	6	3	4	1	2
0	9	8	7	6	5	4	3	2	1

See p. 109.

C CONWAY MAJOR

1	2	3	4	5	6	7	8
2	1	3	5	4	6	8	7
2	3	1	4	5	8	6	7
3	2	1	5	4	8	7	6
2	3	5	1	8	4	6	7
3	2	5	8	1	4	7	6
3	5	2	1	8	7	4	6
5	3	2	8	1	7	6	4
3	5	8	2	7	1	4	6
5	3	8	7	2	1	6	4
5	8	3	2	7	6	1	4
8	5	3	7	2	6	4	1
5	8	7	3	6	2	1	4
8	5	7	6	3	2	4	1
8	7	5	3	6	4	2	1
7	8	5	6	3	4	1	2
8	7	6	5	4	3	2	1

CONWAY ROYAL

1	2	3	4	5	6	7	8	9	0
2	1	3	5	4	7	6	8	0	9
2	3	1	4	5	6	7	0	8	9
3	2	1	5	4	7	6	0	9	8
2	3	5	1	7	4	0	6	8	9
3	2	5	7	1	0	4	6	9	8
3	5	2	1	7	4	0	9	6	8
5	3	2	7	1	0	4	9	8	6
3	5	7	2	0	1	9	4	6	8
5	3	7	0	2	9	1	4	8	6
5	7	3	2	0	1	9	8	4	6
7	5	3	0	2	9	1	8	6	4
5	7	0	3	9	2	8	1	4	6
7	5	0	9	3	8	2	1	6	4
7	0	5	3	9	2	8	6	1	4
0	7	5	9	3	8	2	6	4	1
7	0	9	5	8	3	6	2	1	4
0	7	9	8	5	6	3	2	4	1
0	9	7	5	8	3	6	4	2	1
9	0	7	8	5	6	3	4	1	2
0	9	8	7	6	5	4	3	2	1

The Extension of CONWAY MAJOR.

No. of Bells	8	10	12	14	16	18	20
No of Divisions	8	10	12	14	16	18	20
No of Rows in each Division	4	4	4	4	4	4	4
No of Rows in Course.	32	40	48	56	64	72	80
C.O. of Principle	1-3578642 -	13579086 42 -					
Order in which bells come to Lead.	2358764 1. -	2357.0986 41 -					
Total No of Add Shunts	32.	40	48	56	64	72	80
Position of First set of Add. Shunts	34.67.	34.89	34.1011	34 12.13			
Position of Second do	12 7.8	12 9.10	12 11.12	12 13.14			
No of pairs of bells dodging.	1	2	3	4	5	6	7.

Ad. Inf.

Progression of the Rows.

No of Bells	Position of Row.	Rows.
8	5th	2 3 5 1 8 4 6 7.
10	5	2 3 5 1 7 4 10 6 8 9
12	5	2 3 5 1 7 4 9 6 12 8 10 11
14	5	2 3 5 1 7 4 9 6 11 8 14 10 12 13
16	5	2 3 5 1 7 4 9 6 11 8 13 10 16 12 14 15
18	5	2 3 5 1 7 4 9 6 11 8 13 10 15 12 18 14 16 17.
8	12th.	8 5 3 7 2 6 4 1
10	16	10 7 5 9 3 8 2 6 4 1
12	20	12 9 7 11 5 10 3 8 2 6 4 1
14	24	14 11 9 13 7 12 5 10 3 8 2 6 4 1
16	28	16 13 11 15 9 14 7 12 5 10 3 8 2 6 4 1
18	32.	18 15 13 7 11 16 9 14 7 12 5 10 3 8 2 6 4 1.

The Rows selected for illustration have been taken at random. All other Rows are similarly in progression.

The diagrams of the work of the bells will show that all Hunting Dodging and Place Making are equally in progression.

In the examples I have given, the Divisions of the Principle have expanded horizontally, but vertically have remained constant. On page 2744 we saw that expansion in the Divisions of a Principle can take place both horizontally and vertically. This increased expansion will allow the additional Shunts room to expand in size, and not merely in number and position. We get the following Extension

No of Bells.	6	8	10	12	14	16
No of Divisions	6	8	10	12	14	16
No of Dodging Movements in each Division.	1	3	5	7	9	11
No Rows in Course	24	64	120	192	280	384
No of Rows in each Division	4	8	12	16	20	24
No of Bells in each Add. Shunt.	2	4	6	8	10	12
Position of Add. Shunt.	3-4	3-6	3-8	3-10	3-12	3-14

1	2	3	4	5	6
2	1	3	4	6	5
1	2	4	3	5	6
2	1	4	3	6	5
2	4	1	6	3	5

1	2	3	4	5	6	7	8
2	1	3	5	4	6	8	7
1	2	5	3	6	4	7	8
2	1	5	6	3	4	8	7
1	2	6	5	4	3	7	8
2	1	6	4	5	3	8	7
1	2	4	6	3	5	7	8
2	1	4	3	6	5	8	7
2	4	1	6	3	8	5	7

1	2	3	4	5	6	7	8	9	0
2	1	3	5	4	7	6	8	0	9
1	2	5	3	7	4	8	6	9	0
2	1	5	7	3	8	4	6	0	9
1	2	7	5	8	3	6	4	9	0
2	1	7	8	5	6	3	4	0	9
1	2	8	7	6	5	4	3	9	0
2	1	8	6	7	4	5	3	0	9
1	2	6	8	4	7	3	5	9	0
2	1	6	4	8	3	7	5	0	9
1	2	4	6	3	8	5	7	9	0
2	1	4	3	6	5	8	7	0	9
2	4	1	6	3	8	5	0	7	9

1	2	3	4	5	6	7	8	9	0	E	T
2	1	3	5	4	7	6	9	8	0	T	E
1	2	5	3	7	4	9	6	0	8	E	T
2	1	5	7	3	9	4	0	6	8	T	E
1	2	7	5	9	3	0	4	8	6	E	T
2	1	7	9	5	0	3	8	4	6	T	E
1	2	9	7	0	5	8	3	6	4	E	T
2	1	9	0	7	8	5	6	3	4	T	E
1	2	0	9	8	7	6	5	4	3	E	T
2	1	0	8	9	6	7	4	5	3	T	E
1	2	8	0	6	9	4	7	3	5	E	T
2	1	8	6	0	4	9	3	7	5	T	E
1	2	6	8	4	0	3	9	5	7	E	T
2	1	6	4	8	3	0	5	9	7	T	E
1	2	4	6	3	8	5	0	7	9	E	T
2	1	4	3	6	5	8	7	0	9	T	E
2	4	1	6	3	8	5	0	7	T	9	E

This Extension, when tested, will be shown to be a perfect progression in all its features. It is no doubt somewhat difficult at first sight to recognise that the diagram of the Kascinnis is a true extension of that of the Senior. The difficulty largely vanishes when we remember that the two Places in the Latter are a Complete Hunting Course on two bells, and when we trace the Methods through the increasing numbers of bells. On eight bells and upwards the identity of the diagram is easily seen.

All these Extensions are progressions, but it must be remembered that progression alone does not make a true Extension. It must be a progression of Cyclical movements. You could have a true progression of Places, but that would not necessarily give you a true Extension of a Method. When sometimes argue that Places are the essential things in the Construction of a Method, therefore in an Extension you must reproduce them in the same relative numbers and positions. Thus-

(a)
1	2	3	4	5	6	
2	1	3	4	6	5	

3rd Place (they say) is 3rds from the front; 4th Place is 3rd from behind. Therefore on eight bells they may appear as follows.-

(b)
1	2	3	4	5	6	7	8
2	1	3	5	4	6	8	7

But cyclical movement and not Places is the essential thing in the construction of a Method. (b) will only be the true equivalent of (a) if it is part of some properly extended Hunting or Dodging Movement

(c)
1	2	3	4	5	6	
2	1	3	4	6	5	
1	2	4	3	5	6	
2	1	4	3	6	5	

(d)
1	2	3	4	5	6	7	8
2	1	3	5	4	6	8	7
1	2	5	3	6	4	7	8
2	1	5	6	3	4	8	7

(d) is not an Extension of (c) because in (c) the Movements are complete, but in (d) they are incomplete.

C. The Extension of Group II Methods.

The Extension of Group II Methods is -

1. The Extension of the Principle;
2. The Extension of the Constructional Shunts;
3. The Extension of the Additional Shunts (if there are any).

(a) Methods on the Plain Principle

The Plain Principle expands equally in regular progression as the difference in the numbers of Bells.

1. The Extreme Constructional Shunts.

The Extreme Constructional Shunt is a cyclical movement on part of the total number of Bells.

It divides the Bells into Hunts and Extreme Bells, and involves -

(a) A Hunting Course of the Extreme Bells in opposite order to the movement of the Principle;

(b) A Cyclical path of the Hunts, through the Coursing Order of the Extreme

Bells.

From the nature of movement, both cycles (a) and (b) can expand as the difference in the numbers of Bells involved in them.

The number of Bells comprising either, can expand in regular progression, but as the division into Hunts and Extreme Bells is necessarily in a different ratio from the numbers of Bells in the Principle, expansion will be unequal.

On any number of Bells there are but two positions in which Extreme Hunts can be made — Before and Behind;* and therefore on all numbers there are but three possible Combinations A, B and A+B.

Extension of any one of these Combinations will be the expansion in regular progression of the number of Hunt Bells, or Extreme Bells, or both. The following formula (page 294) gives every possible Extension from four Bells (the minimum) upwards.

In the symbols the top figure represents the number of Hunts and the bottom the number of Extreme Bells. Thus $\frac{2}{7}$ represents two Hunts and seven Extreme Bells.

* See p. 150.

a = Plain Bob. Reverse Bob and Double Bob.

c = do do. (Short Courses)

b = Grandsire Reverse Grandsire and Double Grandsire.

The Extension of the EXTREME CONSTRUCTIONAL SHUNTS

(a)

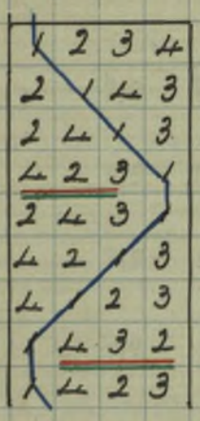
1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	→
1	1	1	1	1	1	1	1	1	1	

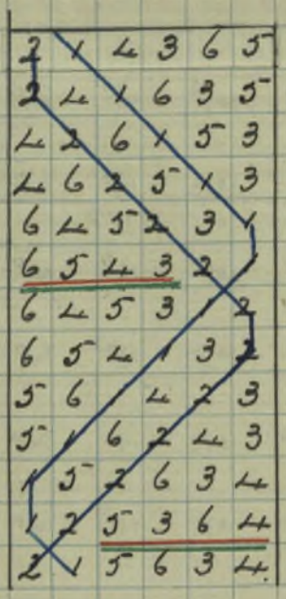
(b)

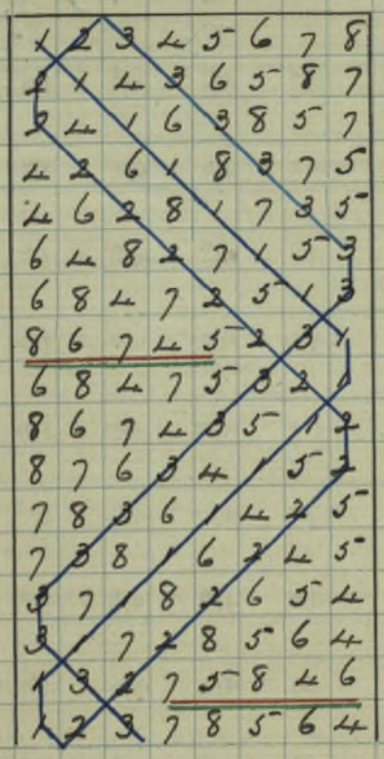
2/3	2/4	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	→
1	1	1	1	1	1	1	1	1	1	↗

(c)

3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	→
1	1	1	1	1	1	1	1	1	1	↗
4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	→
1	1	1	1	1	1	1	1	1	1	↗
5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	5/12	→
1	1	1	1	1	1	1	1	1	1	↗
6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	→
1	1	1	1	1	1	1	1	1	1	↗
7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	→
1	1	1	1	1	1	1	1	1	1	↗
8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	→
1	1	1	1	1	1	1	1	1	1	↗
9/3	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	→
1	1	1	1	1	1	1	1	1	1	↗
10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	→
↓	↓ ↘	↓ ↘	↓ ↘	↓ ↘	↓ ↘	↓ ↘	↓ ↘	↓ ↘	↓	

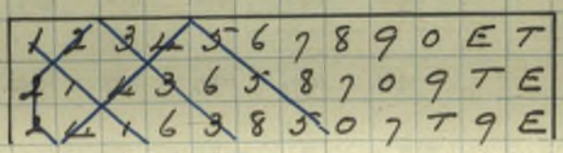


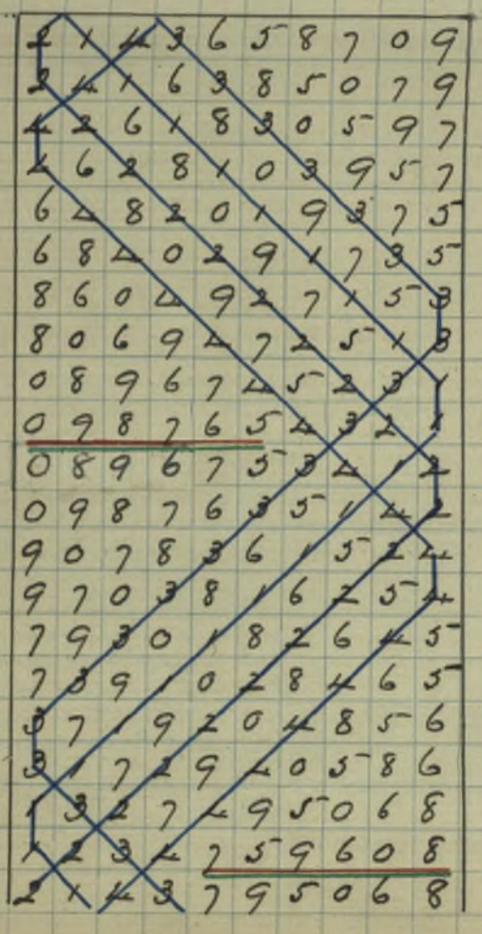


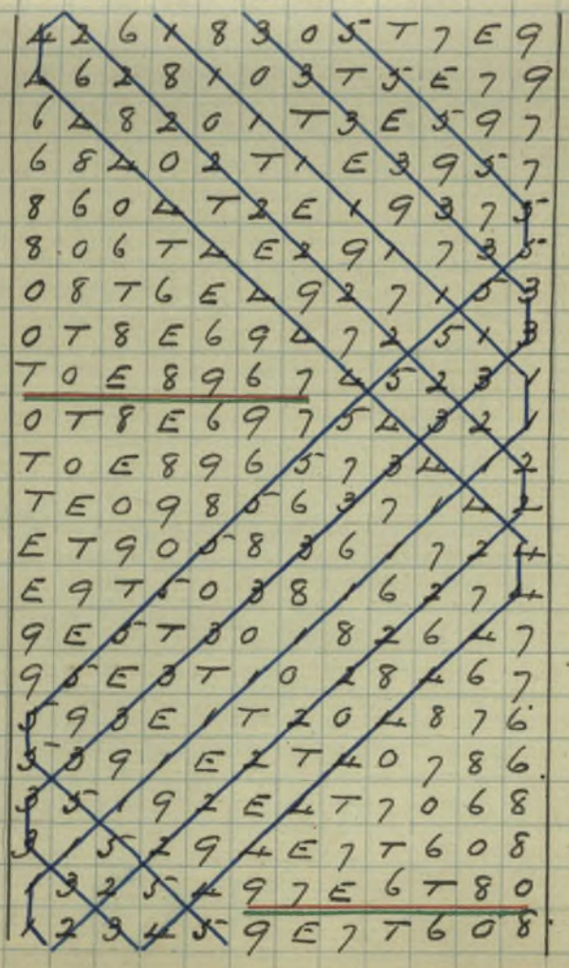


Example of
Extension from Formula
page 394.

$\frac{1}{3} - \frac{2}{4} - \frac{3}{5} - \frac{4}{6} - \frac{5}{7} - \frac{6}{8} \rightarrow$







2. The Court Shunts

A Court Shunt is a cyclical movement on part of the total number of Bells. It divides the Bells into Hunts and Extreme Bells, and involves a cyclical path of the Hunts through the Causing Order of the Extreme Bells. Each member of the cycle on the Extreme Bells is made in two parts.

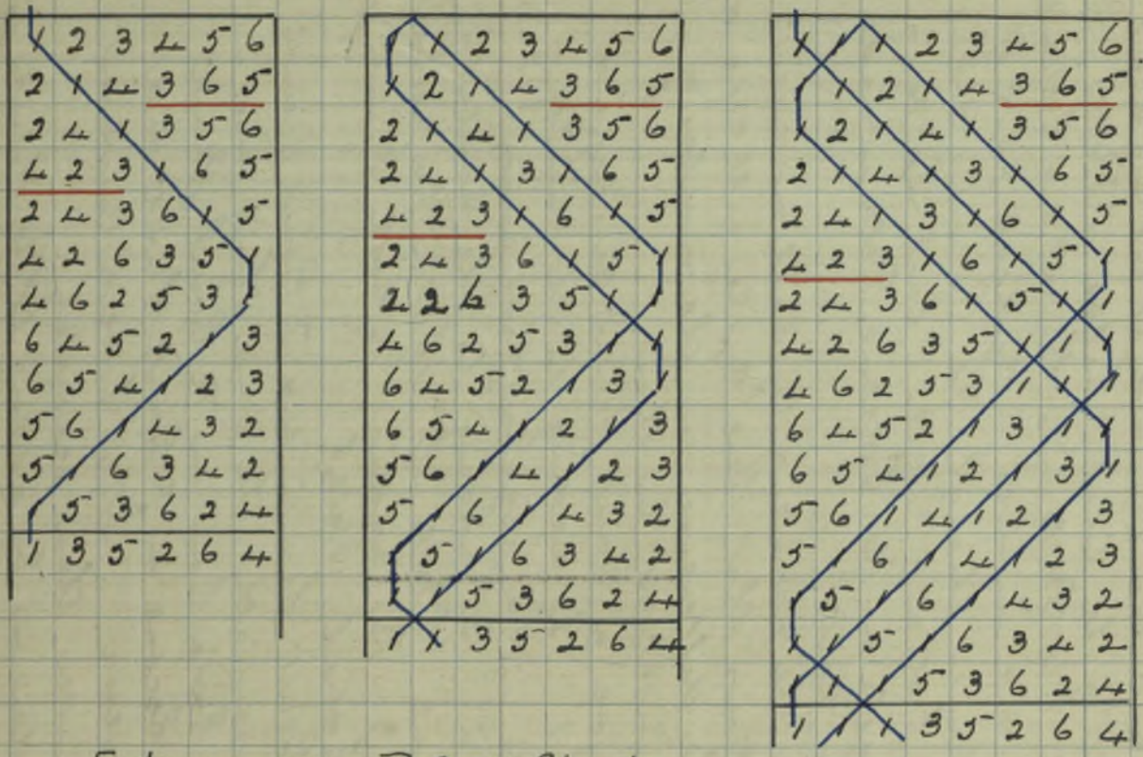
From the nature of cyclical movement it follows that these cycles will expand as the difference in the number of bells involved in them.

Therefore a Court Shunt can expand

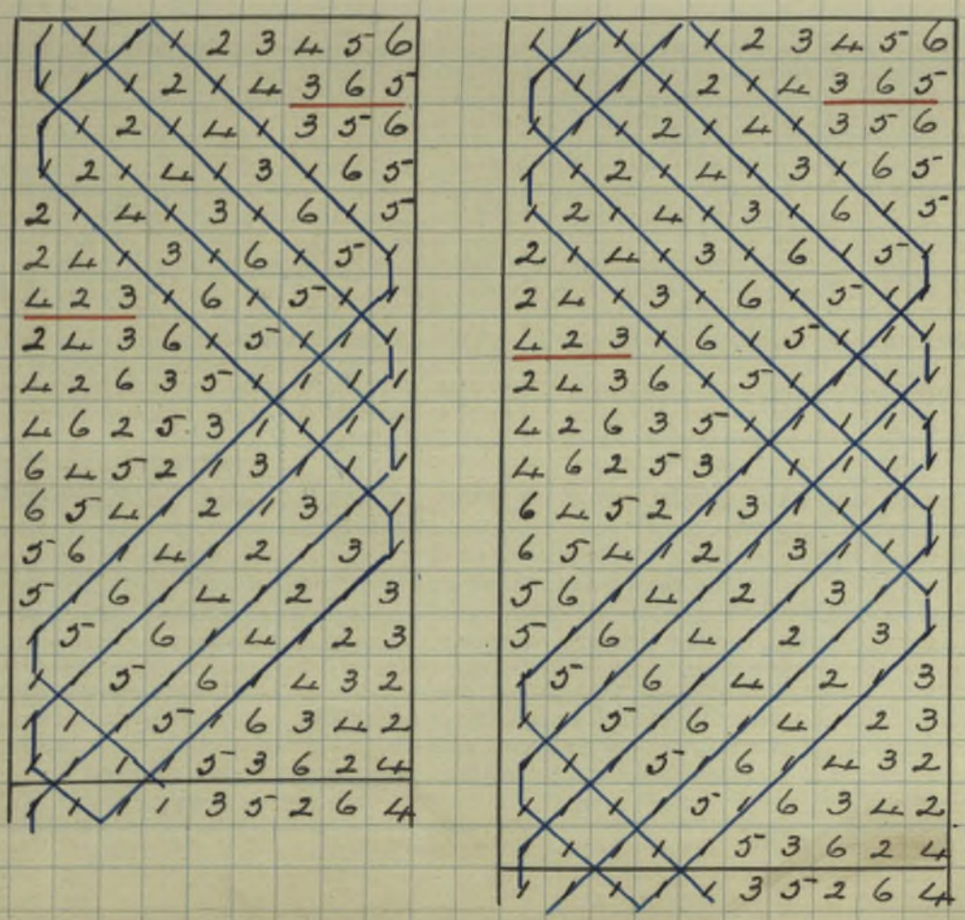
1. By adding to the number of Hunts in a regular progression
2. By adding to the number of Extreme Bells in regular progression.
3. By adding to both Hunts and Extreme Bells.

R Court Shunts and P Court Shunts are essentially the same thing, and in some Extensions an R Court Shunt may become a P Court Shunt, and vice versa. It is however convenient to consider them separately.

Extension by adding to the Hunts is



Extension of an R Court Shunt
by adding to Hunts.



a matter which concerns all Group II Methods equally, and will be dealt with briefly later.

An R Court Shunt expands in regular ratio as the difference in the numbers of Extreme Bells.

X	2	3	4	5	6	
2	X	4	3	6	5	
2	4	X	3	5	6	
4	2	3	X	6	5	
2	4	3	6	X	5	
4	2	6	3	5	X	

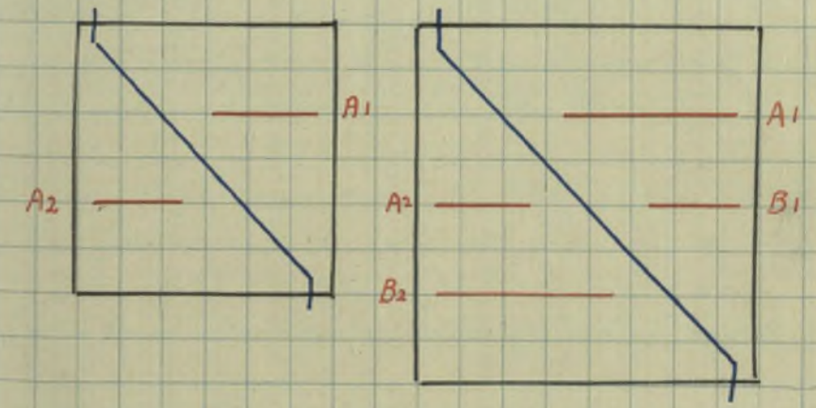
X	2	3	4	5	6	7	8	
2	X	4	3	6	5	8	7	
2	4	X	3	5	6	7	8	
4	2	3	X	6	5	8	7	
2	4	3	6	X	8	5	7	
4	2	6	3	8	X	7	5	

X	2	3	4	5	6	7	8	9	0	
2	X	4	3	6	5	8	7	0	9	
2	4	X	3	5	6	7	8	9	0	
4	2	3	X	6	5	8	7	0	9	
2	4	3	6	X	8	5	0	7	9	

X	2	3	4	5	6	7	8	9	0	E	T
2	X	4	3	6	5	8	7	0	9	T	E
2	4	X	3	5	6	7	8	9	0	E	T
4	2	3	X	6	5	8	7	0	9	T	E
2	4	3	6	X	8	5	0	7	T	9	E

Owing to the expansion of the Plain Principle, the number of positions in which R Count Shunts can be made increases in regular progression

No of Extreme BELLS.	5	7	9	11	13	15	17	19	→
No of Positions of R.C. Shunts Hunt up }	1	2	3	4	5	6	7	8	→
do do Hunt down.	1	2	3	4	5	6	7	8	→

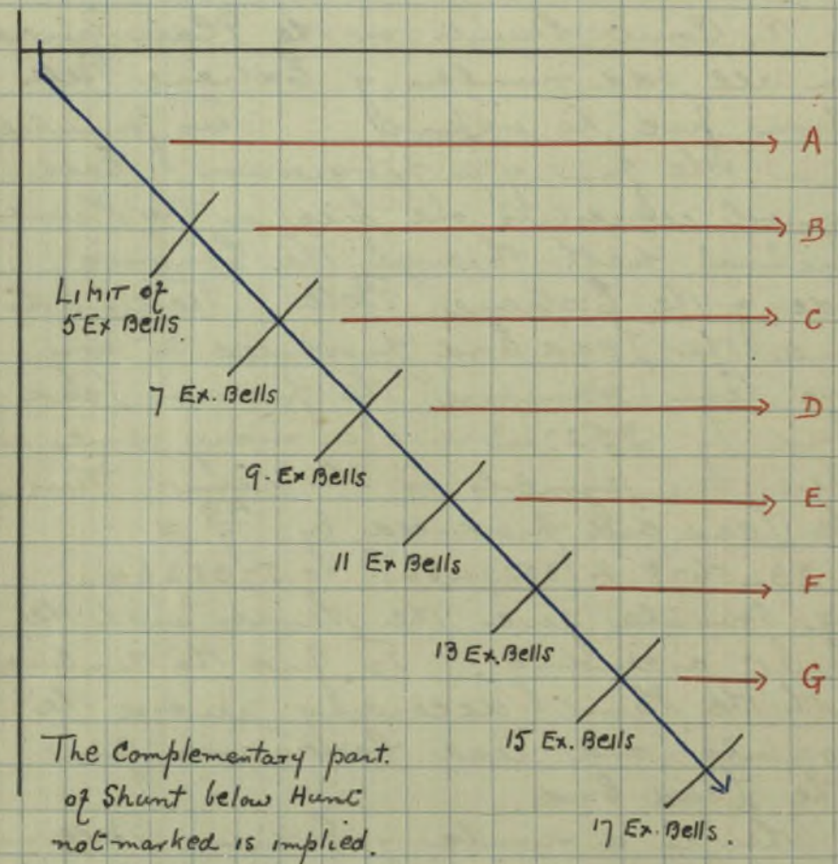


Neither A (7 Ex BELLS), nor $\frac{B}{7}$, nor $\frac{A+B}{7}$, is exactly the same thing as $\frac{A}{5}$; but each is equally an equivalent, and therefore each is equally a true Extension. Similarly, each of the combinations of the R Shunts in the three positions with nine Extreme Bells, is an Extension. And so on with the increased number

of Combinations on the higher numbers.
The following formulae give -
1. all the possible Combinations of R. Court Shunts on the Plain Principle on all odd numbers of Extreme Bells from five to infinity. This formulae is in the form of a progression. Each symbol represents one step in the Shunts cyclical path through the Changing Orders of the Extreme Bells. To find the Lead End produced by any one term, transpose the previous Lead End by 3527486..... as many times as there are symbols in the term. Thus the Lead end produced by $\frac{AB}{7}$ =
$2345678 \times (3527486)^2 = 5738264$.
The formula gives the Shunts with the Hunt ascending. To find the Combinations with the Hunt descending, reverse the formula, and read backwards from the Lead End.

When in a number of Extreme Bells in strict progression, a series of these terms also in strict progression, is applied a fine Extension is produced.

Formula 2. (page 302) gives the more important of these Extensions.

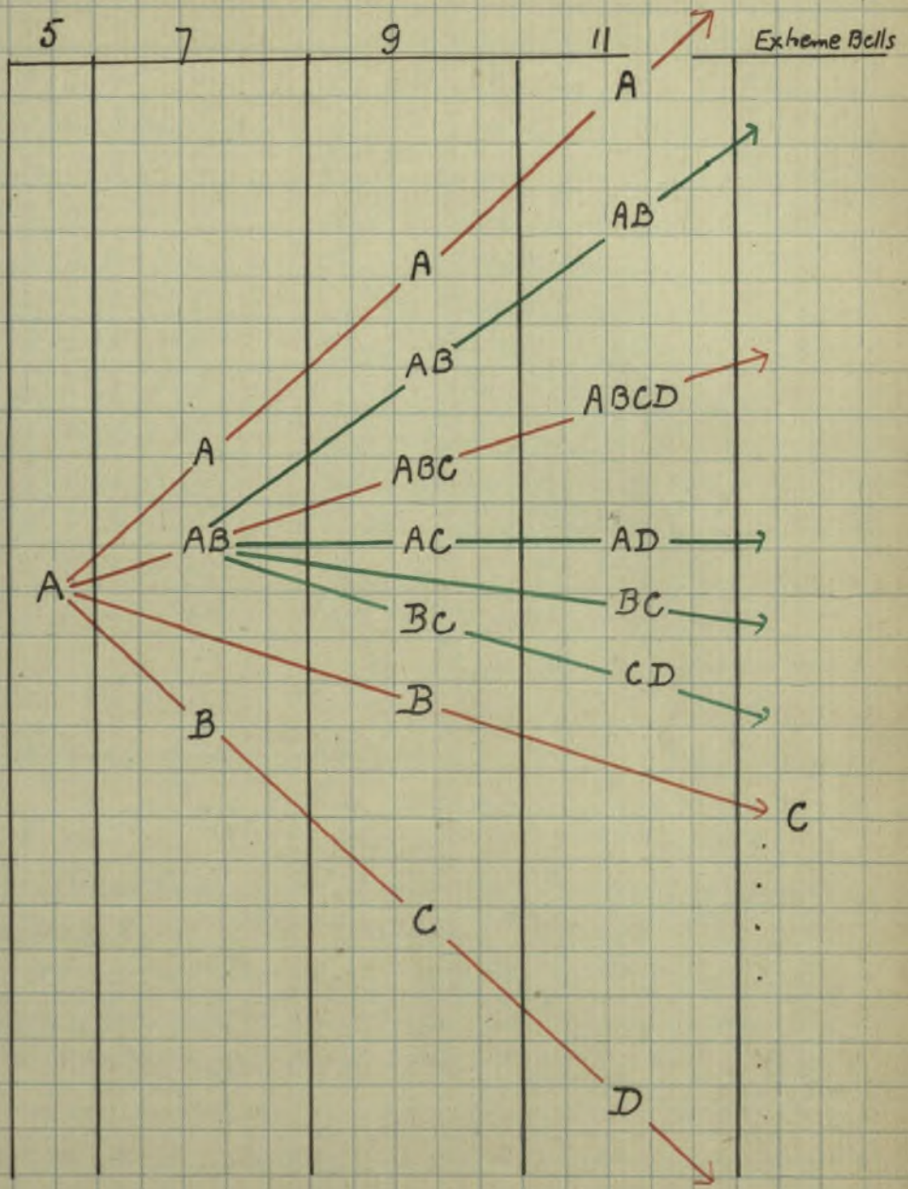


The Complementary part of Shunt below Hunc not marked is implied.

LIMIT OF EXTREME BELLS.

5	A
	A B
7	B
	A B C
	A C
	B C
9	C
	A B C D
	A B D
	A C D
	A D
	B C D
	B D
	C D
11.	D
	A B C D E
	A B C E
	A B D E
	A B E
	A C D E
	A C E
	A D E
	A E
	B C D E
	B C E
	B D E
	B E
	C D E
	C E
	D E
13	E
	A B C D E F
	A B C D F
	A B C E F
	A B C F
	A B D E F
	A B D F
	A B E F
	A B F
	A C D E F
	A C D F
	A C E F
	A C F
	A D E F
	A D F
	A E F
	A E
	B C D E F

Ad. Inf.


5
7
9
11
Extreme Bells
A
AB
A
AB
ABCD
A
ABC
AB
AC
AD
A
BC
BC
CD
B
B
C
C
D

A
5.

A.

	1	2	3	4	5	6
	2	1	4	3	6	5
A1	2	4	1	3	5	6
	4	2	3	1	6	5
A2.	2	4	3	6	1	5
	4	2	6	3	5	1
	4	6	2	5	3	1
	6	4	5	2	1	3
	6	5	4	1	2	3
	5	6	1	4	3	2
	5	1	6	3	4	2
	1	5	3	6	2	4
	V 3	5	2	6	4	

Two Examples will suffice to illustrate the Extension of R Court Shunts.

A shows an R.C. Shunt with five Extreme Bells Hunt ascending.

The position of this Shunt can be described as follows.

1. It is the nearest position to the Hunts whole pull Before;

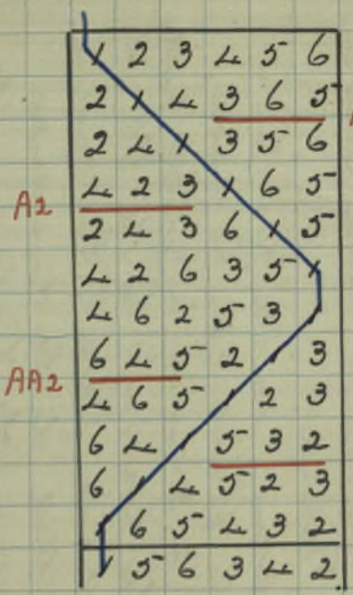
2. It is the nearest position to the Hunts whole pull Behind;

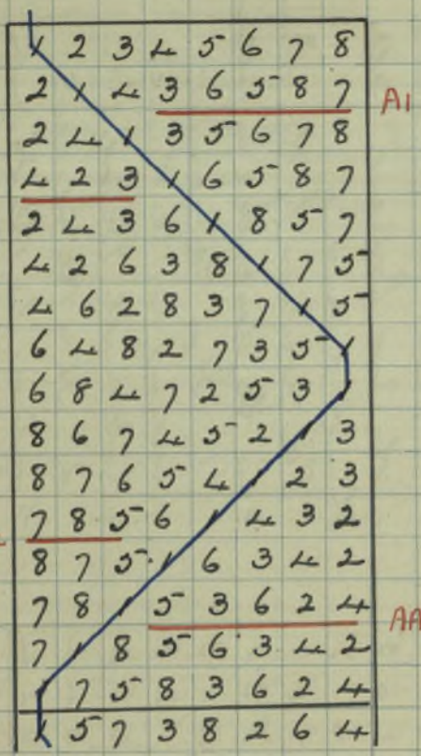
3. It is the position midway between the Hunts whole pulls at Before and Behind.

4 It is every possible position in which an R C Shunt can be made.

Neither 1, 2, 3 nor 4, by itself, fully represents the position of the Shunt with five Extreme Bells, but each is equally entitled to be considered the equivalent on the higher numbers.

The position of the Shunt with the Hunt descending corresponds. This gives us the following Extensions.

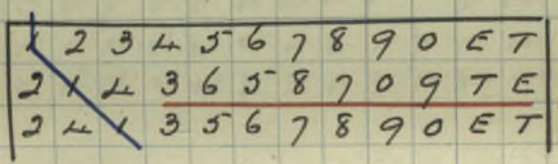


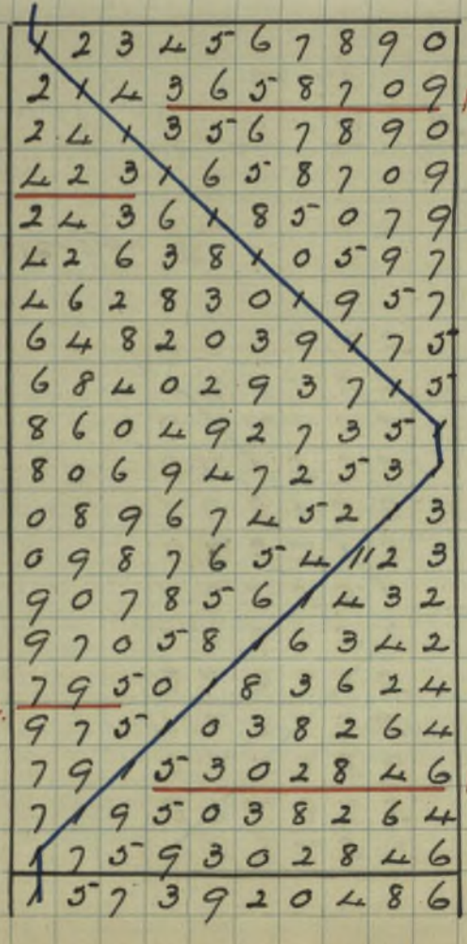


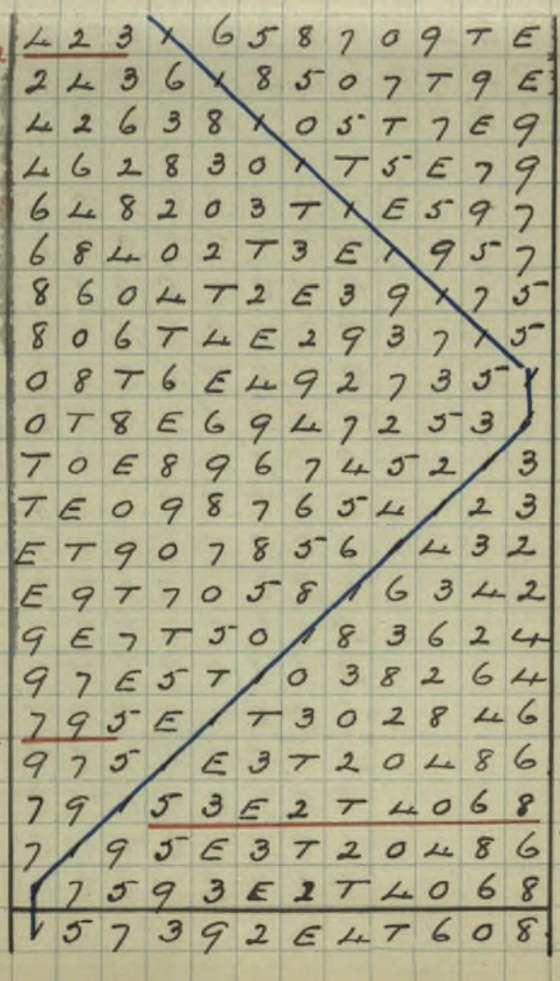
Extension I

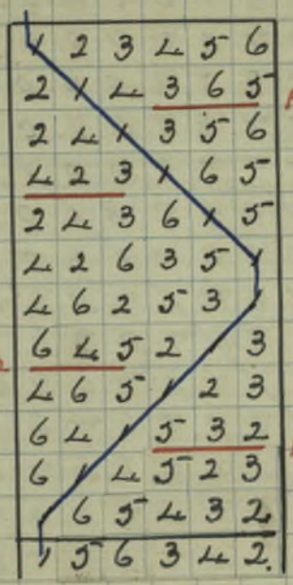
$\frac{A}{5}$ $\frac{A}{7}$ $\frac{A}{9}$ $\frac{A}{11}$ $\frac{A}{13}$ $\frac{A}{15}$ →

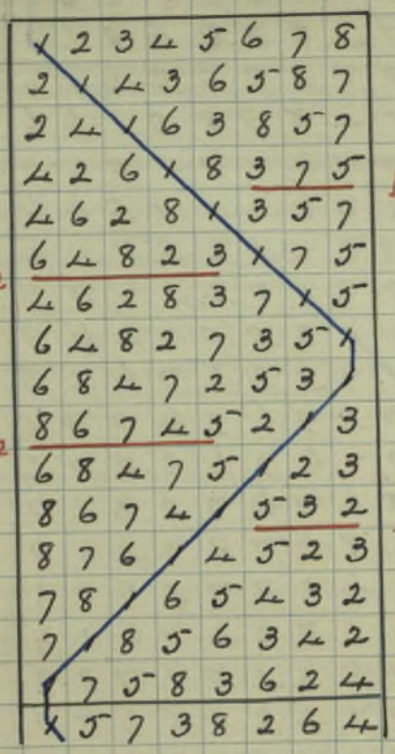
ad. inf.







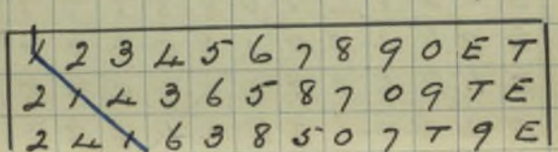


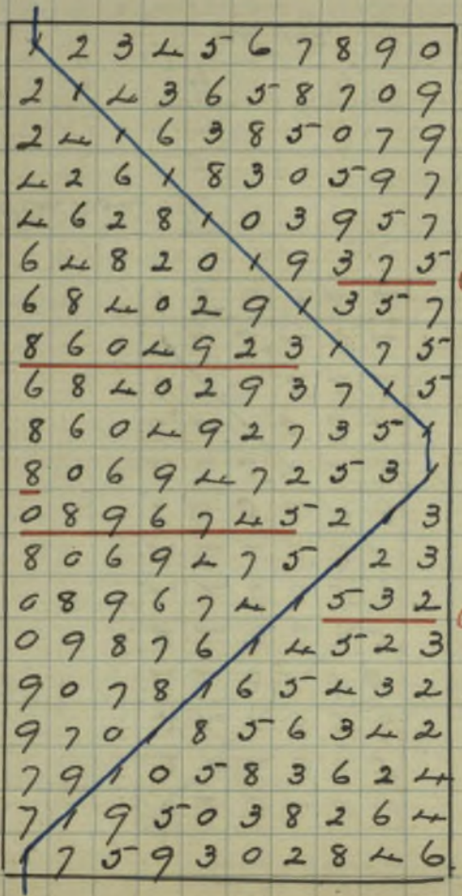


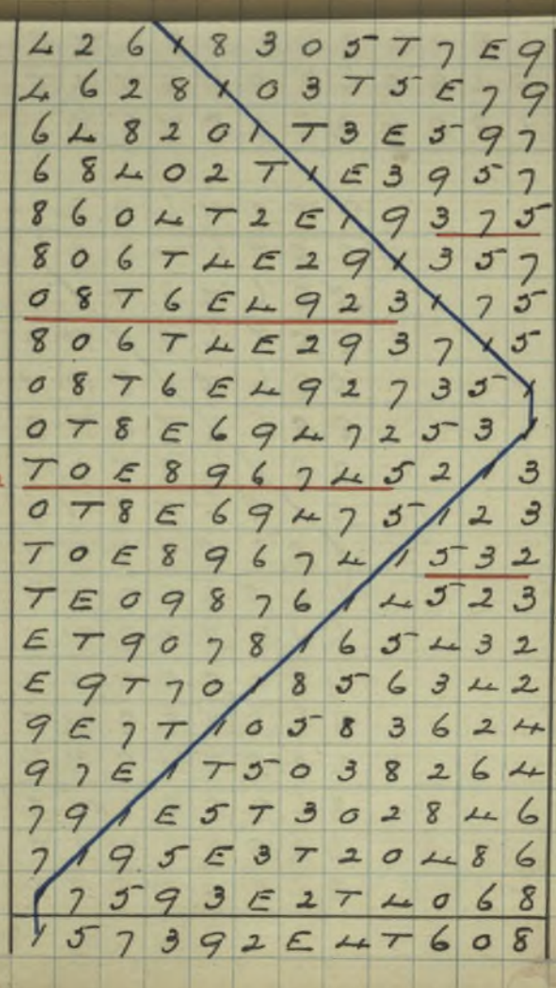
Extension II.

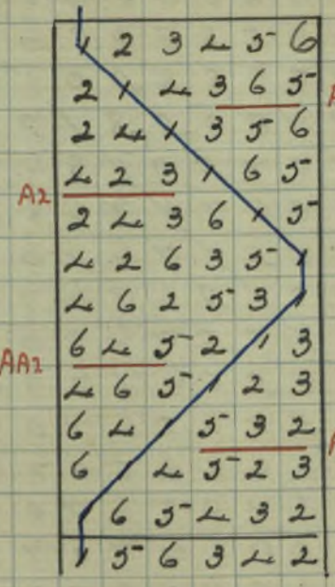
A	B	C	D	E	F
5	7	9	11	13	15

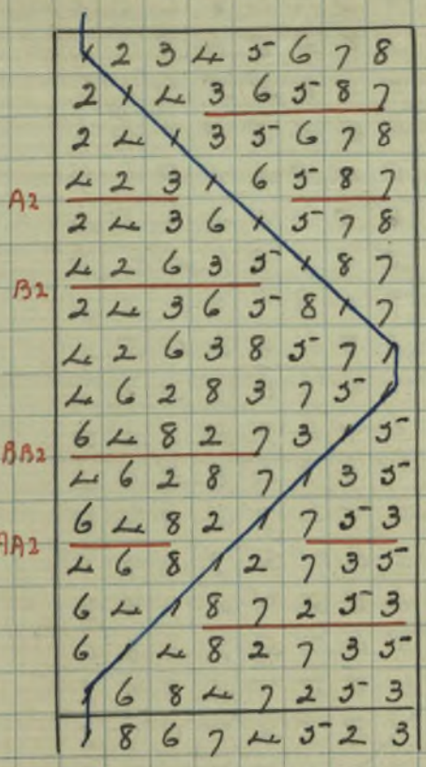
ad. inf.







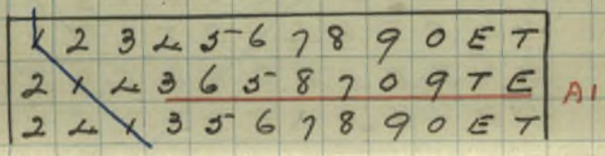


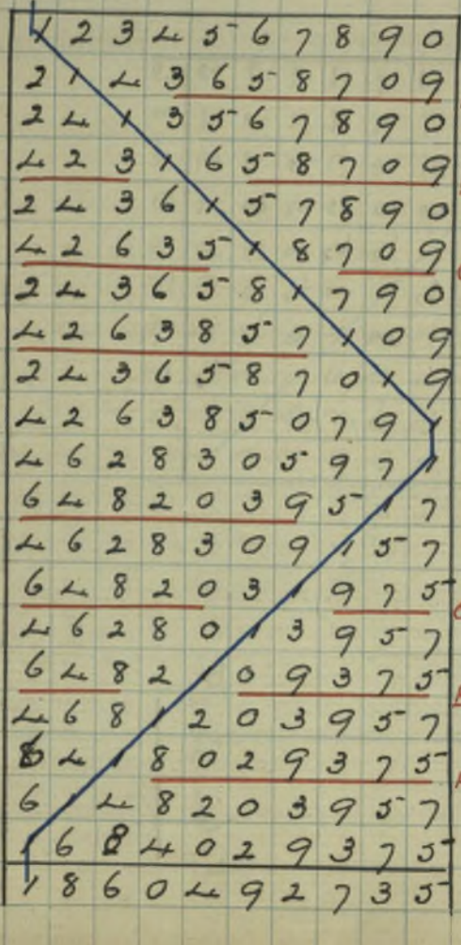


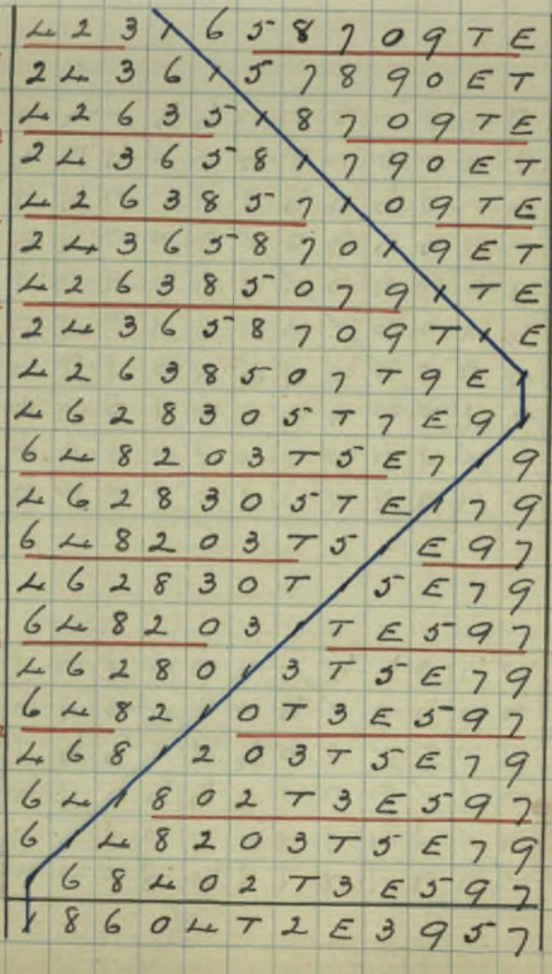
Extension III

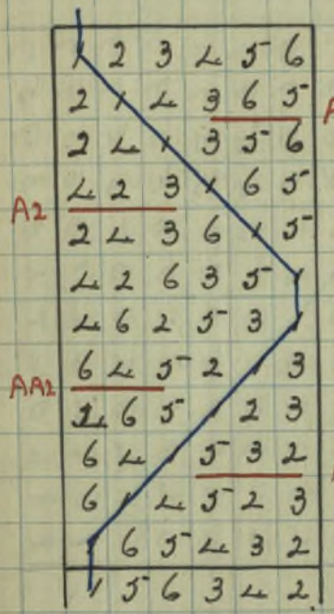
A	AB	ABC	ABCD
5	7	9.	11

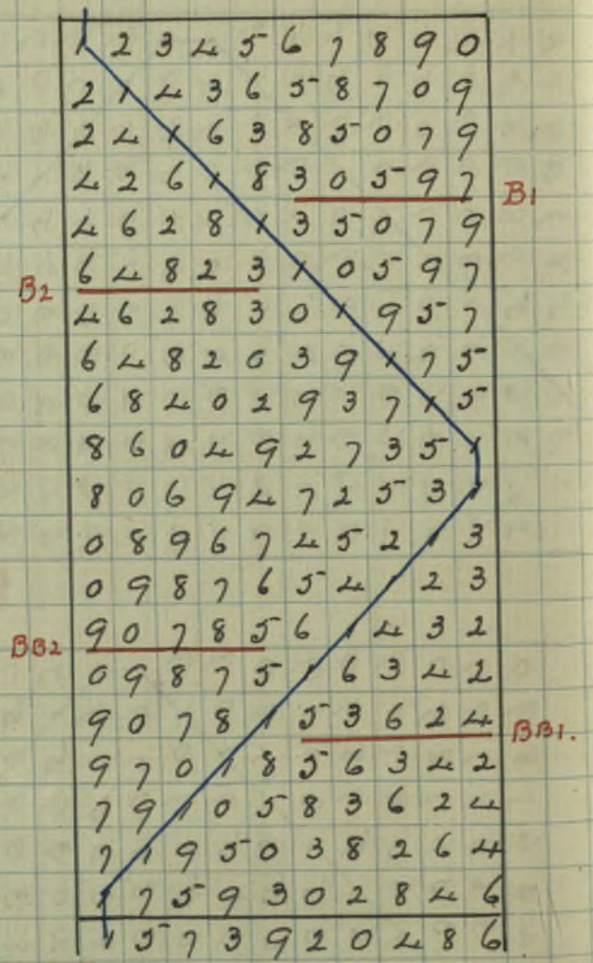
ad inf.

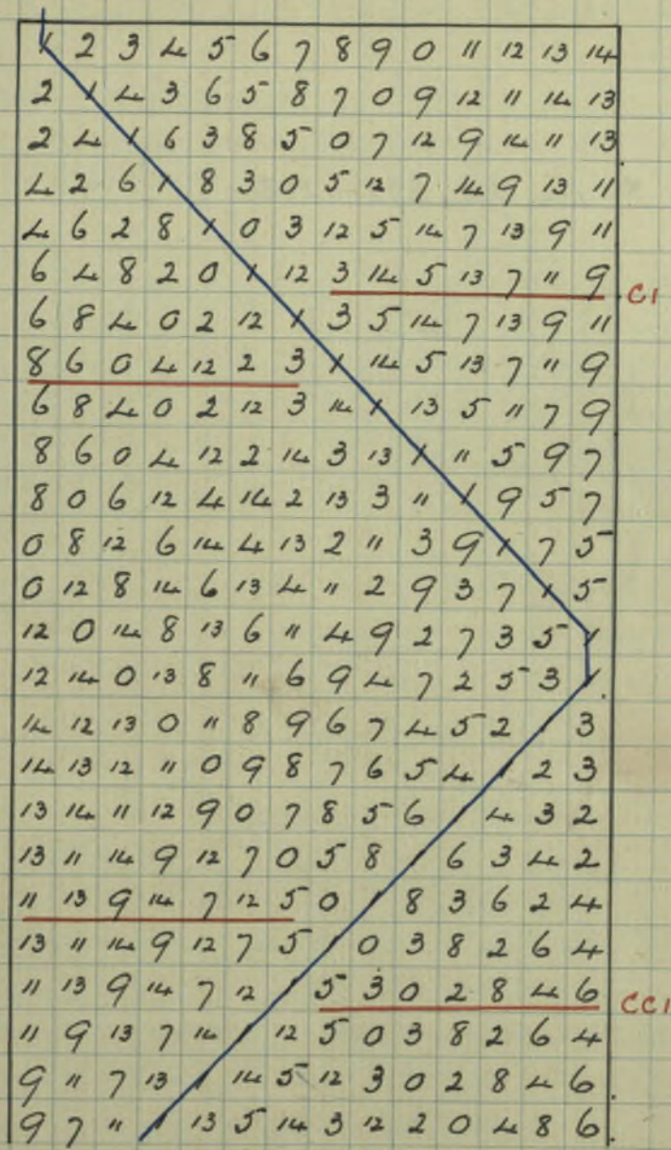












Extension IV

A	B	C	D	E	F	G	H	
5	9	13	17	21	25	29	33	Ad inf.

* See pp. 278 - 283.

If these four Extensions are tested they will be found to be true progressions in every feature. There are four of them for a similar reason that there are four Extensions of Forward in Minor*

These Shuffles are :-

	1	2	3	4	5	6	7	8
	2	1	4	3	6	5	8	7
A1	2	4	1	3	5	6	7	8
	4	2	3	1	6	5	8	7
A2	2	4	3	6	1	5	7	8
B1	4	2	6	3	5	1	8	7
B2	2	4	3	6	5	8	1	7
	4	2	6	3	8	5	7	1

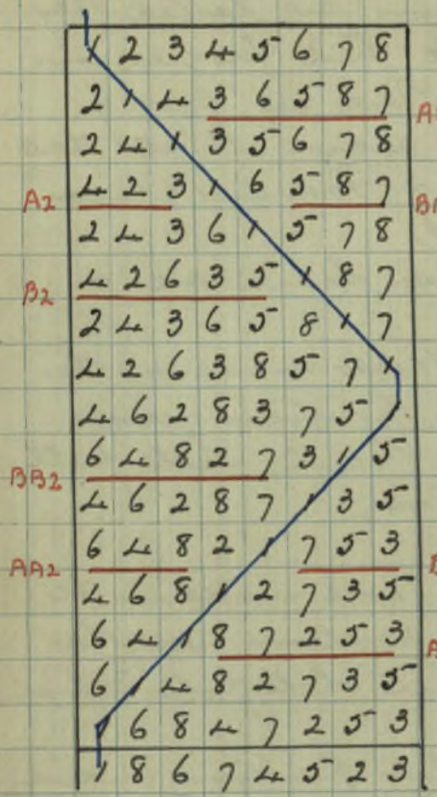
1. Those made in the two positions next the Hunts Whole pull Before;

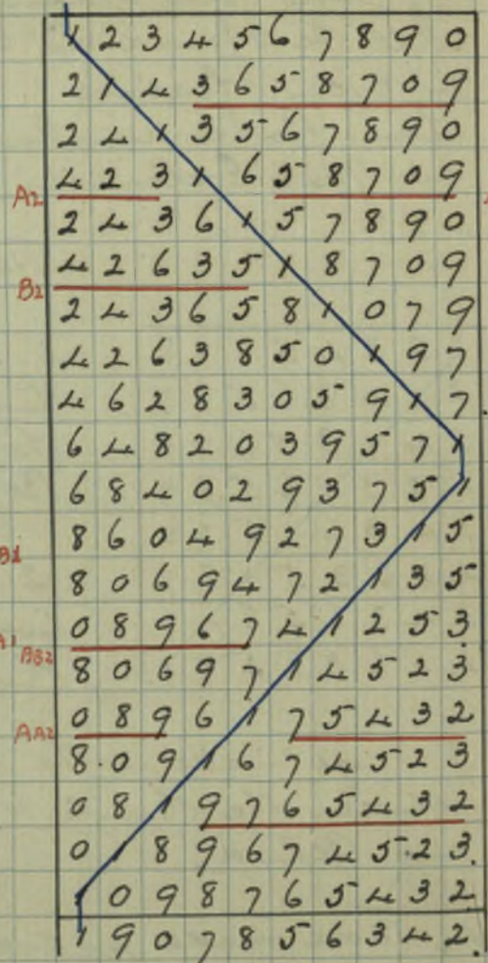
2. Those made in the two positions next the Hunts Whole pull Behind;

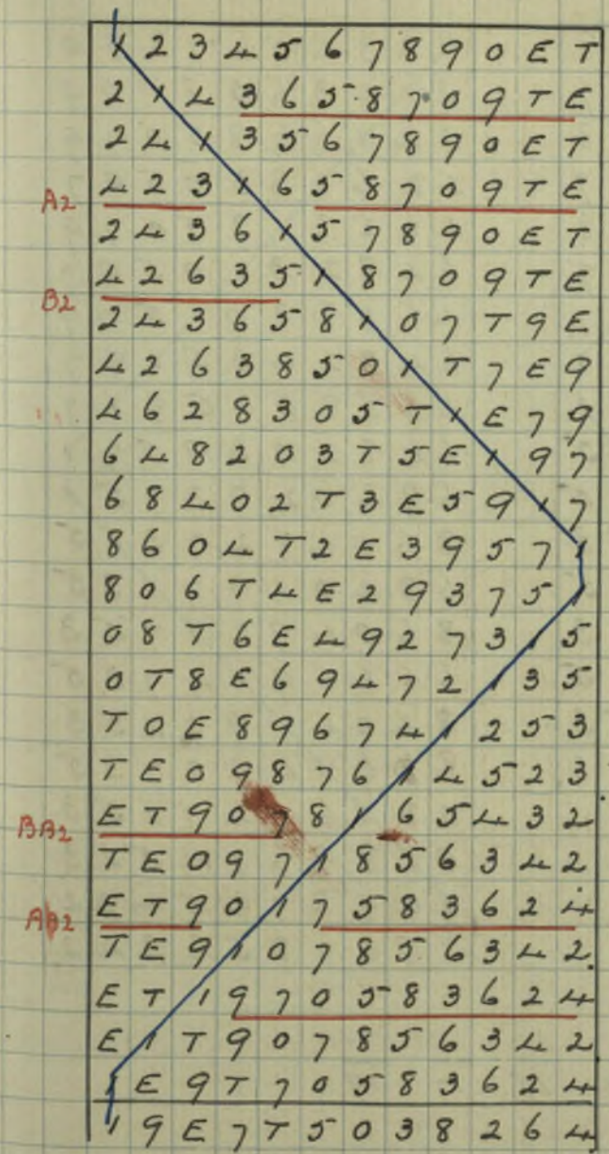
3 Those made in the two positions midway between the Hunts Whole pulls Before and Behind;

4. Those made in every possible position;

5. Those made in the position next the Hunts Whole pull Before, and the Hunts Whole pull Behind.

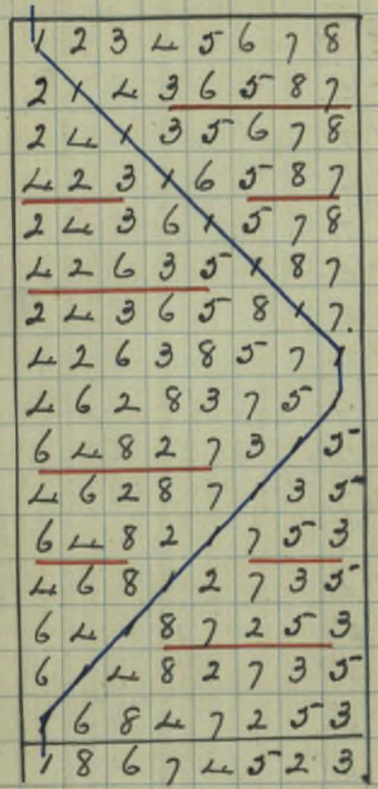


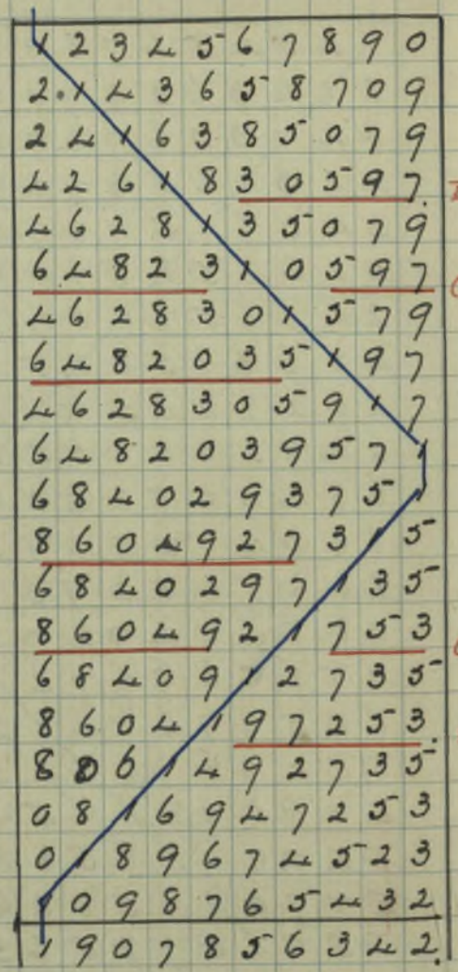




Extension I.

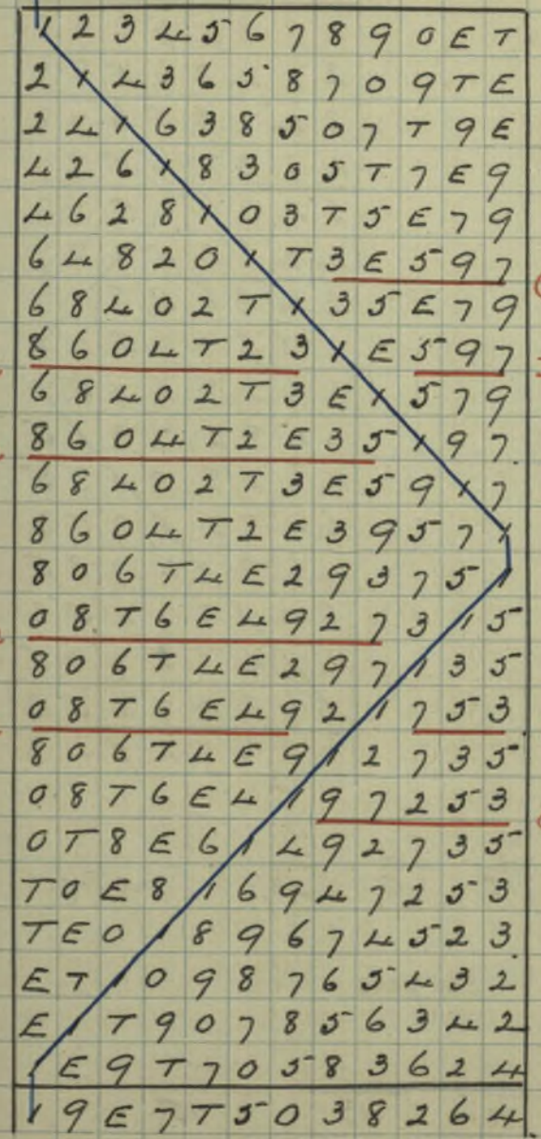
AB	AB	AB	AB	AB	AB	AB	AB	
7	9	11	13	15	17	21	23.	Ad. Inf.

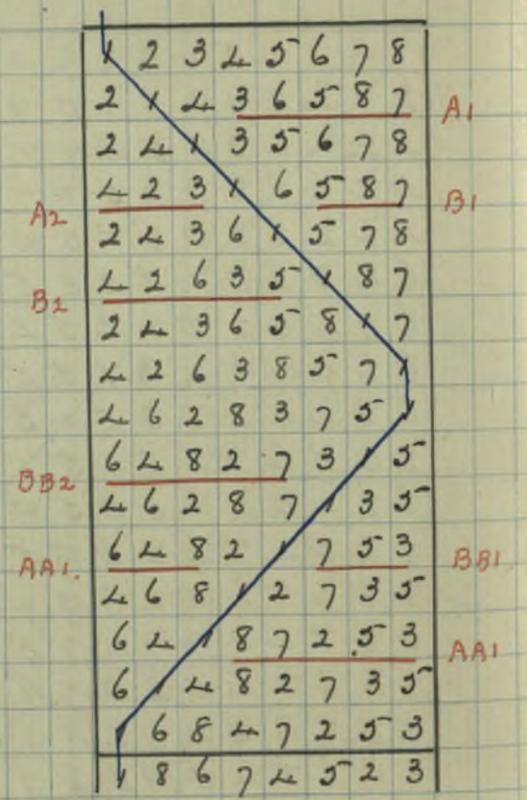




Extension II.

AB	BC	CD	DE	EF	FG	GH
7	9	11	13	15	17	19.



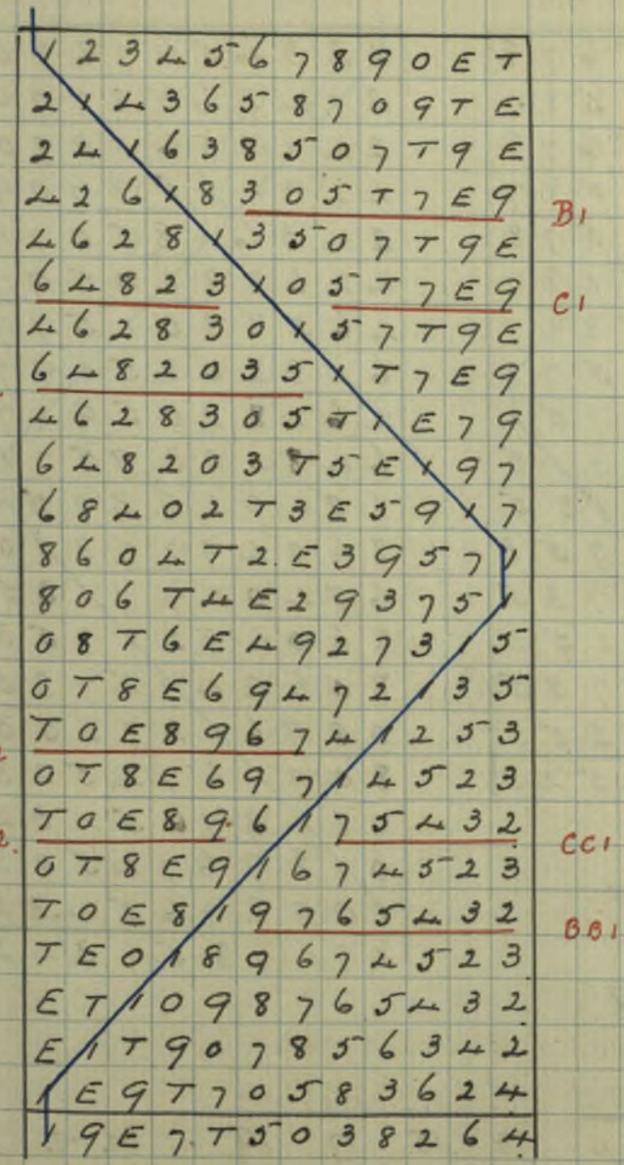


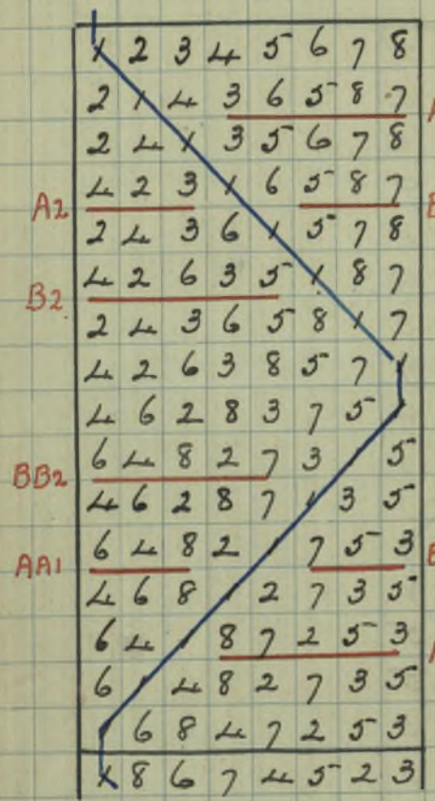
Extension III.

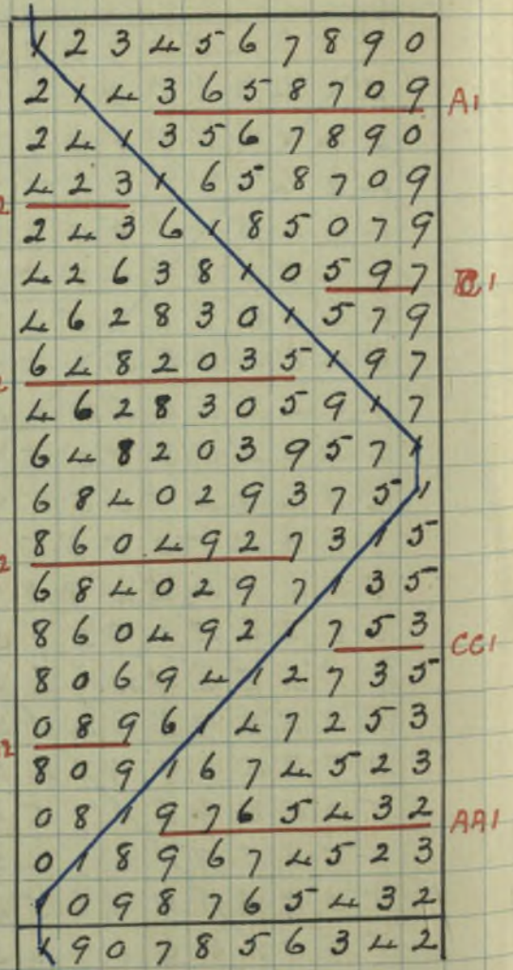
AB. 7. BC. 11. CD. 15. DE. 19. EF. 23. ad Inf.

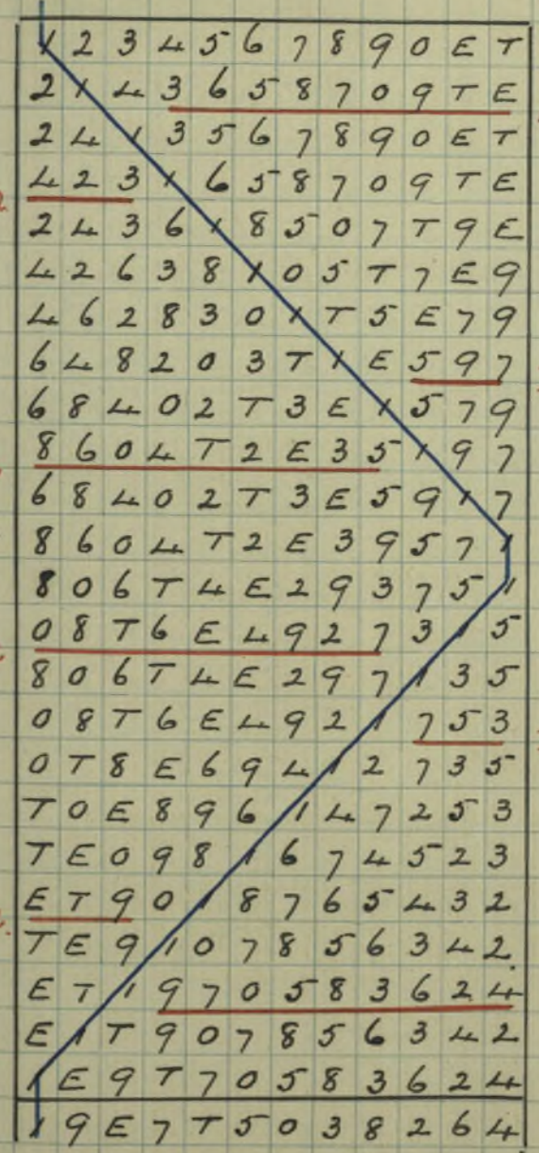
Extension IV see page. 306.

AB. 7 ABC. 9. ABCD. 11 ABCDE 13 ABCDEF. 15.









Extension V

AB	AC	AD	AE	AF	AG	AH
7	9	11	13	15	17	19

. Ad. inf.

All Court Shunts are essentially the same things; the difference between R and P Court Shunts being a matter chiefly of classification. Therefore the Extension of P Court Shunts and mixed R and P Court Shunts, is exactly similar to that of R Court Shunts alone.

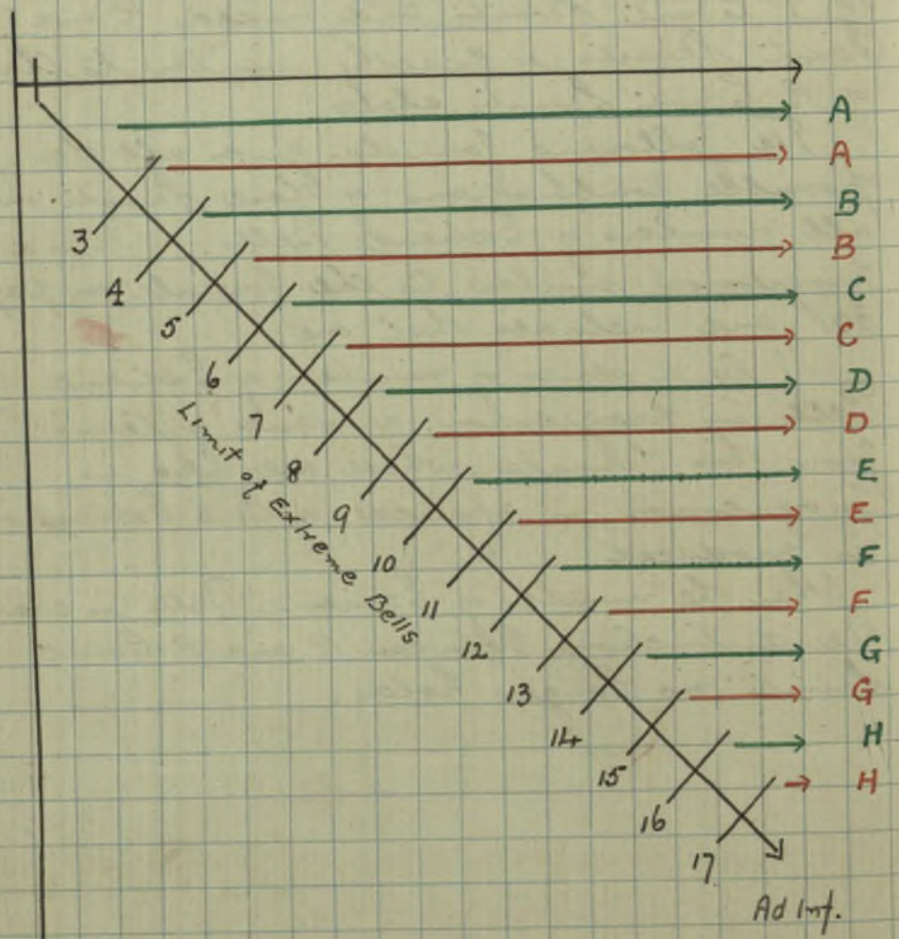
The following formula gives all the possible combinations of these Shunts on all numbers of Extreme Bells. It is a progression similar to the formula on page 301 and includes that one.

If to a series of numbers of Extreme Bells in progression, a series of terms from this formula, which are also in progression, is applied, a true Extension is produced.

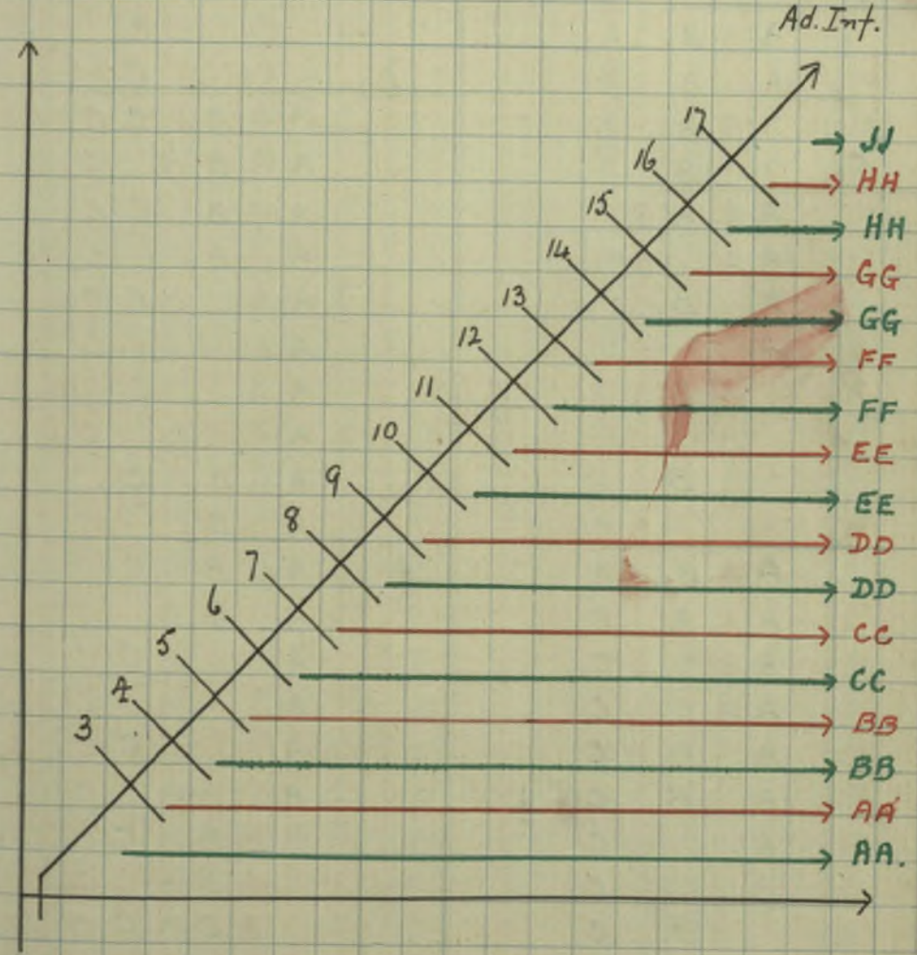
When the number of Extreme Bells is even the distinction between R and P Court Shunts no longer holds.

Mixed R and P Court Shunts

Hunt Ascending



Hunt decending



LIMIT OF EXTREME BELLS.

3

A

A A

4

A

A A B

A B

A B

5

B

A A B B

A A B

A B B

A B

A B B

A B

B B

6

B

A A B B C

A A B C

A A B C

A A C

A B B C

A B C

A B C

A B C

A B C

A B B C C

A B B C

A B C C

A B C

A B C C

7

A A B B C C

A A B B C

A A B C C

A A B B C

A A B C C

A A B C

A A C C

A A C

A B B C C

A B B C

A B C C

A B C

A B C C

A B C

A B B C C

A B B C

A B C C

A B C

A B C C

8

A A B B C C D

A A B B C D

A A B B C D

A A B B D

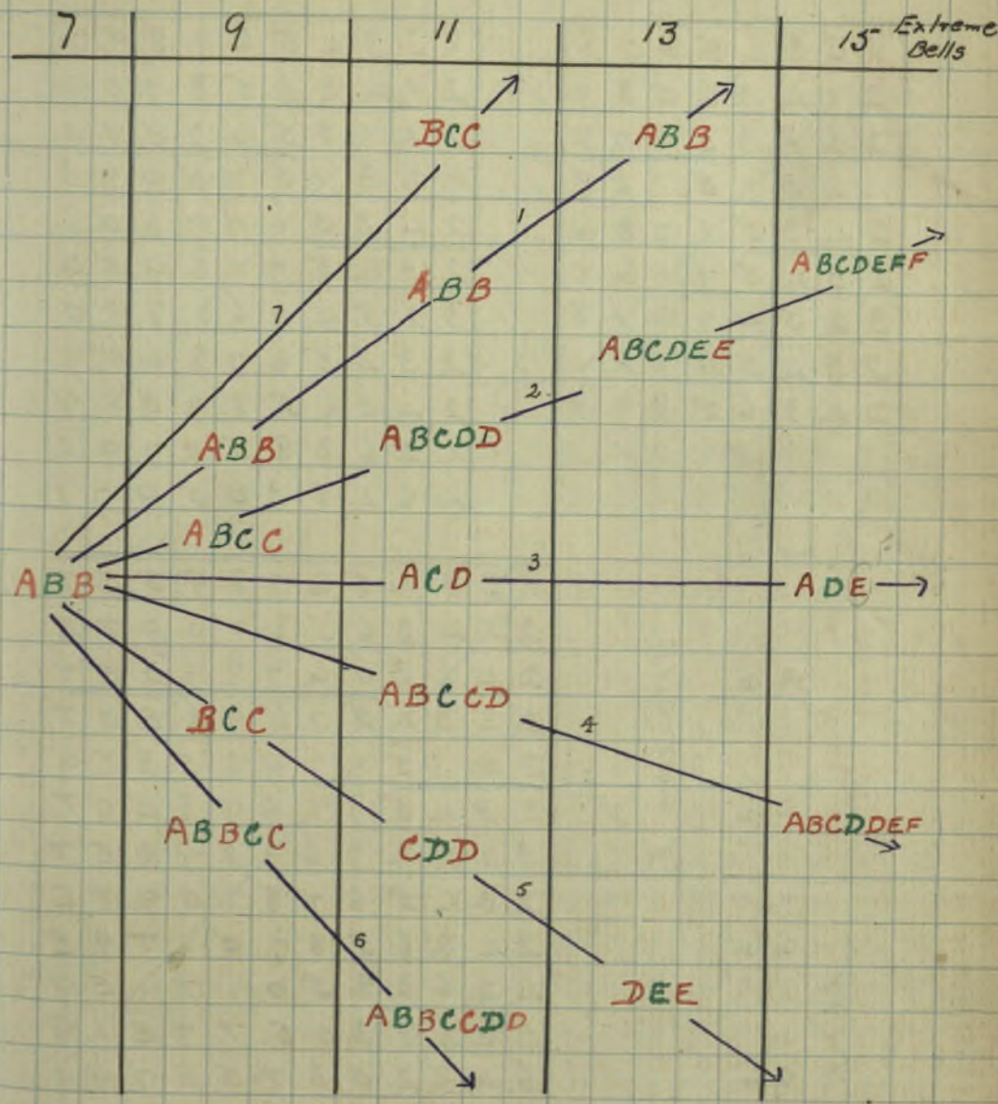
A A B C C D

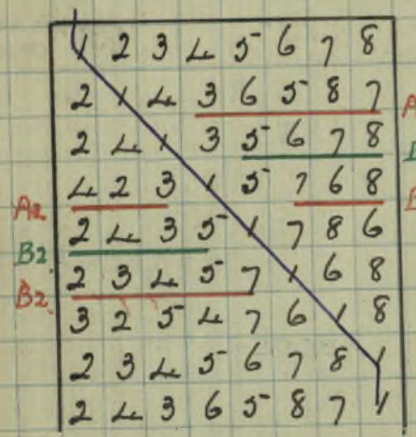
A A B C D

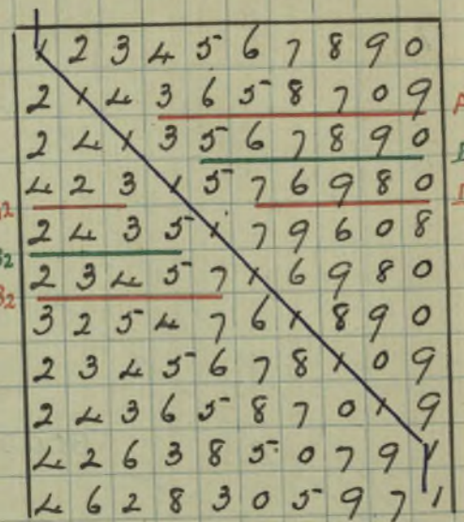
A A B C D

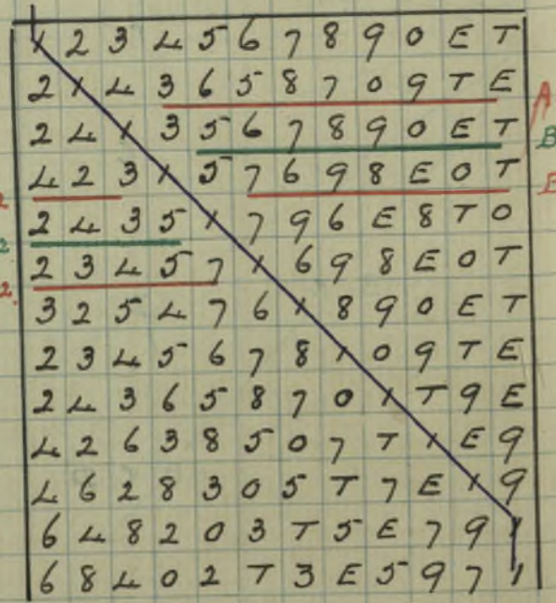
A A B

Example of Exlension from Formula. p. 315





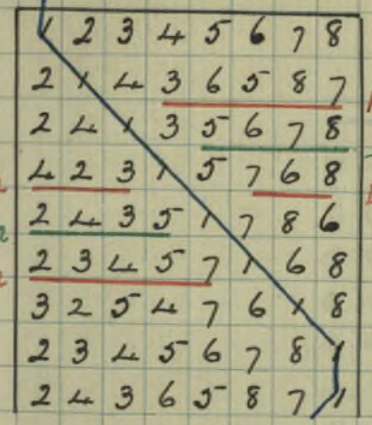


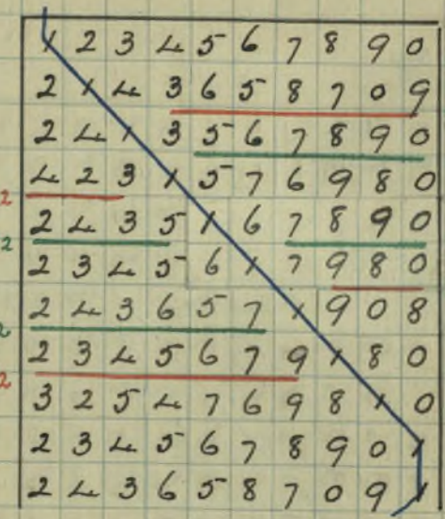


Extension I.

7	ABB
9	ABD
11	ABB
13	ABB
15	ABB

Ad Inf.

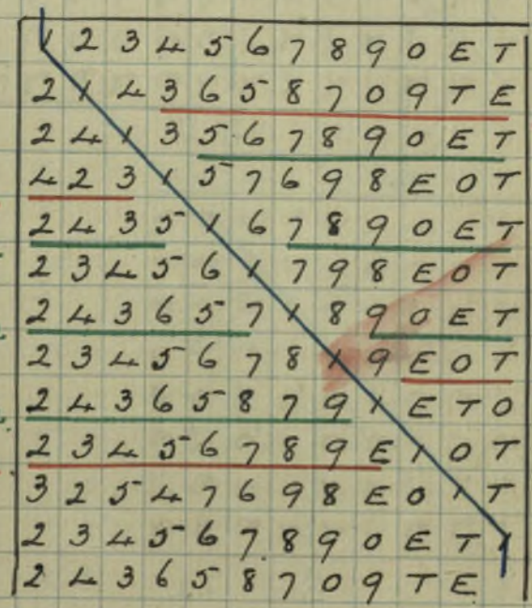


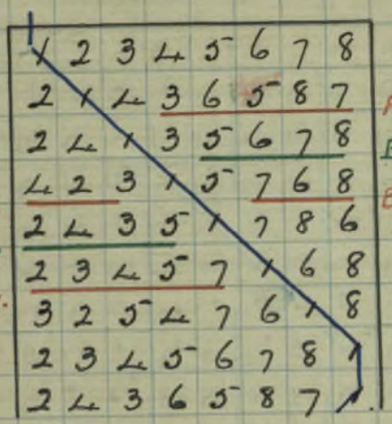


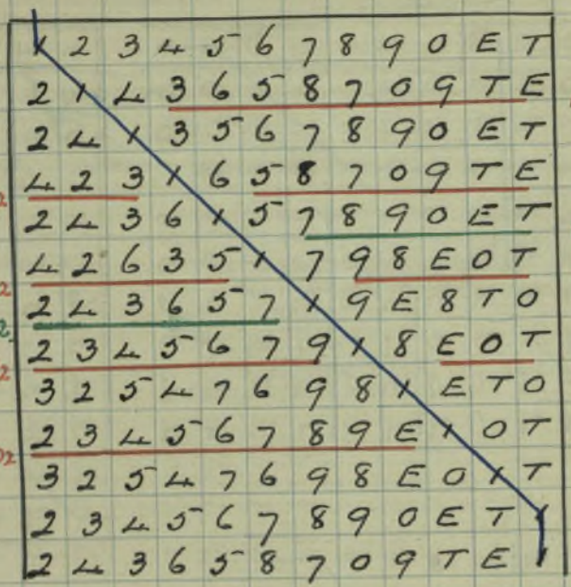
Extension II

7	ABB
9	ABCC
11	ABCDD
13	ABCDEE

Ad Inf.





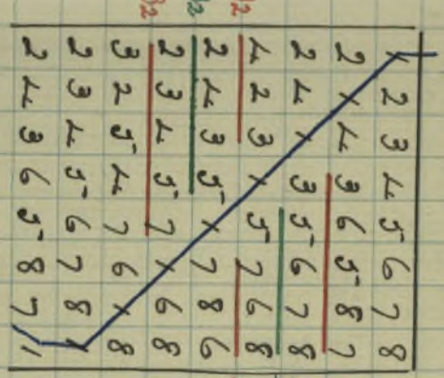


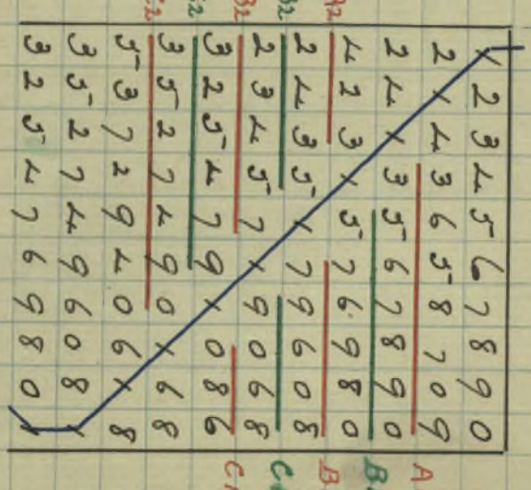
Extension IV.

ABB	ABCCD	ABCDDEF	ABCDEEFGH	
7	11	15	19.	Ad. inf.

Extension VI.

ABB	ABBCC	ABBCCDD	
7	9	11	Ad. inf.





As Single Canti Shunts are identical with Canti Shunts, (except that the second portion of each member is made above the Hunt when that bell is descending, instead of below the Hunt when that bell is ascending,) the formulae given on pages 301 and 314 will produce the total number of combinations possible on all numbers of bells, and will also give every Rule Extension. Only those terms in the formulae which are symmetrical about a point midway between the Hunt Whole pulls before and behind, will give symmetrical combinations of Single Canti Shunts. The ordinarily accepted rules for producing Single variations of Method are Constructionally not quite sound.

Reverse Canti Shunts extend similarly to Single Canti Shunts.

Slow Work Shunts divide the total number of Bells into.

(a) Slow Work Bells;

(b) other Bells.

(a) are Hunts of a secondary cycle;

(b) are Extreme Bells of the same cycle.

The omission of one Member of this secondary cycle becomes one Member of the Constructional Shunts of the Method.

The Constructional Shunts divides the total number of bells into

(c) Hunts

(d) Extreme Bells.

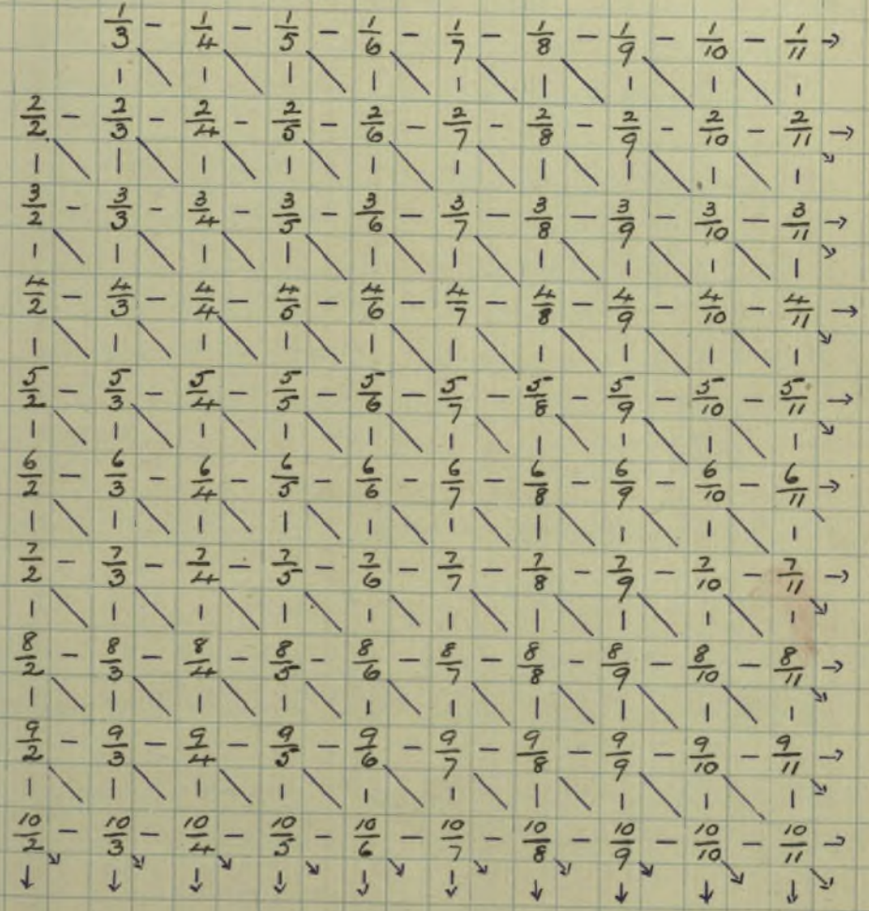
The second division is a different one from the first.

By the nature of cyclical movement, each cycle included in the above can expand in regular progression as the number of bells involved in it. Since the ratio of expansion of the cycles is different, the expansion of the Method will necessarily be unequal.

The following formula gives every Slow Work Shunt and all numbers to infinity.

In the formula the top figure in each term represents the number of Slow Work Bells, and the bottom figure the number of other Bells. Thus $\frac{4}{5}$ represents four Slow Work Bells and five other Bells in a Method on nine Bells.

The Extension of the SLOW WORK CONSTRUCTIONAL SHUNTS



Ad. inf.

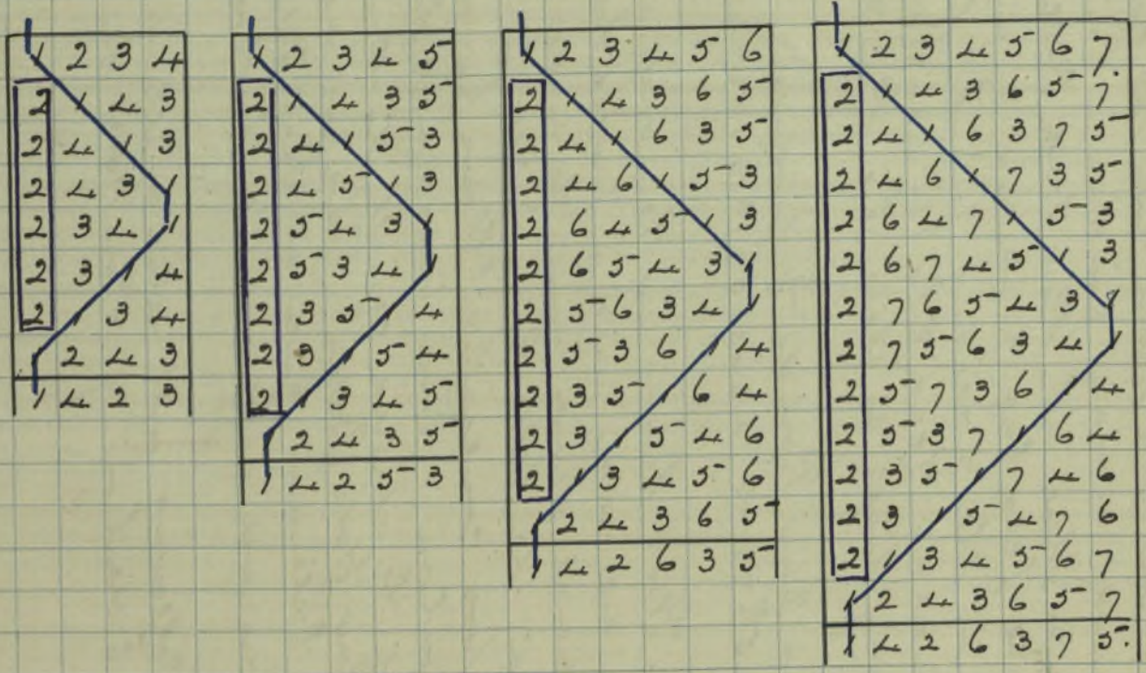
As a Slow Work Shunt puts the Hunt backwards as many positions in Causing Order as there are Slow Work Bells, to find the Lead End produced by any term in the preceding formula, transpose the previous Lead End by 426385 .... as many times as there are Slow Work Bells.

Thus from Rounds $\frac{3}{5}$ produces:-

$$12345678 \times (426385)^3 = 18674523$$

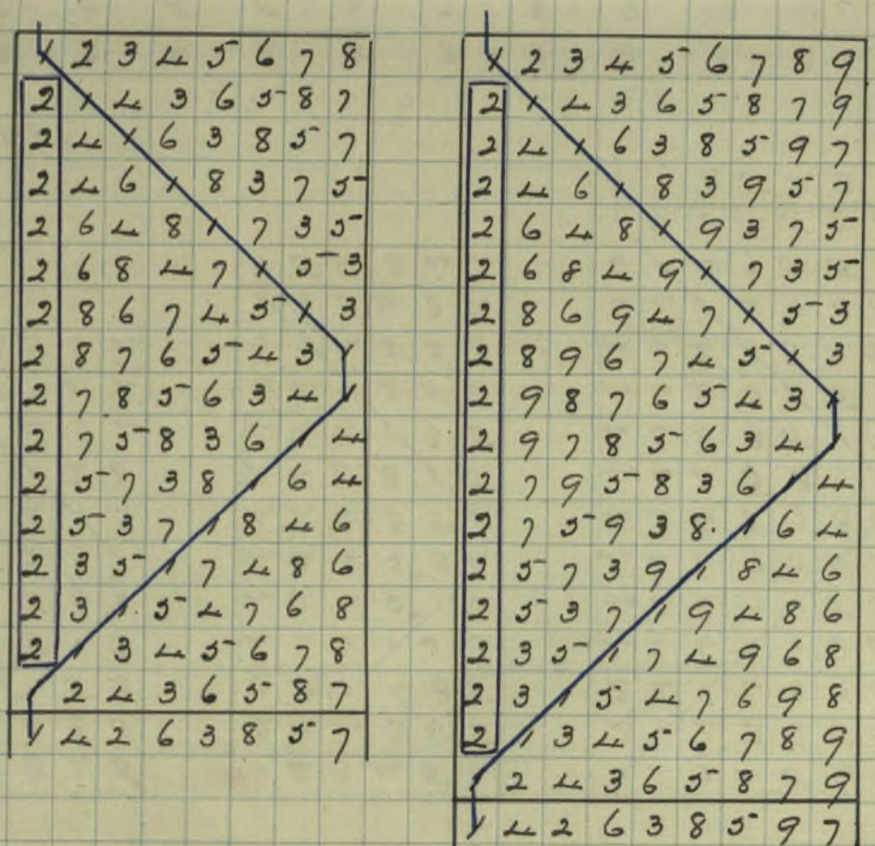
Slow Work Shunts in their original state, are never used in practical methods. Additional Shunts must be made to prevent the bells lying still for more than two consecutive blows in any one position. These Additional Shunts cannot be applied equally to all numbers of Slow Work Bells. Therefore many of the Extensions given on page 321. are of no use in practical methods.

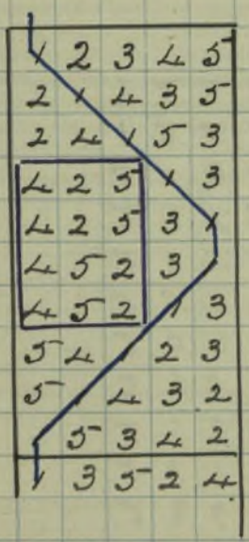
The following will serve as illustrations of the Extension of Slow Work Shunts.

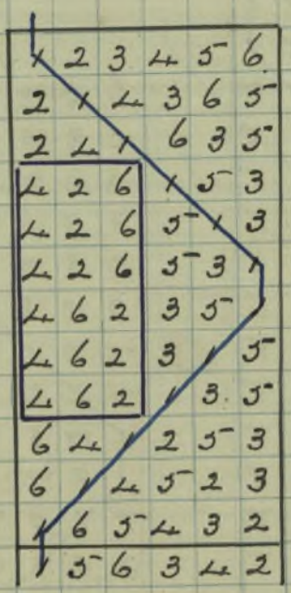


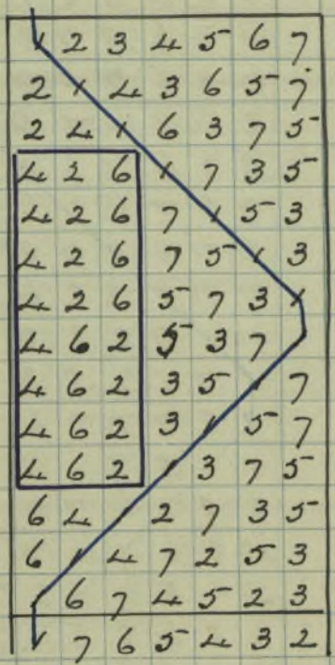
Example I

$\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{6}$ $\frac{1}{7}$ $\frac{1}{8}$ $\frac{1}{9}$ $\frac{1}{10}$ $\frac{1}{11}$ $\frac{1}{12}$ Add'nt.



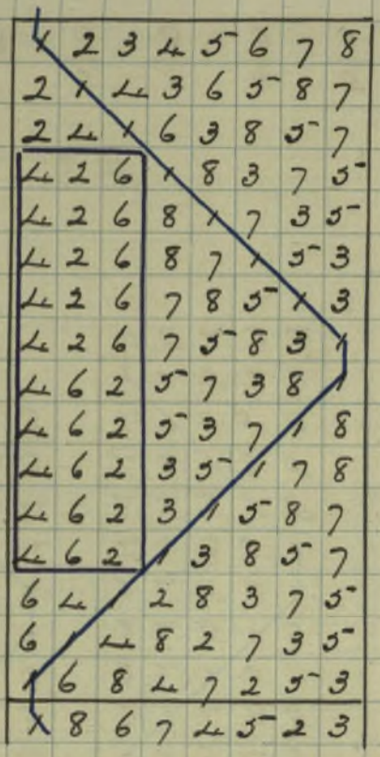


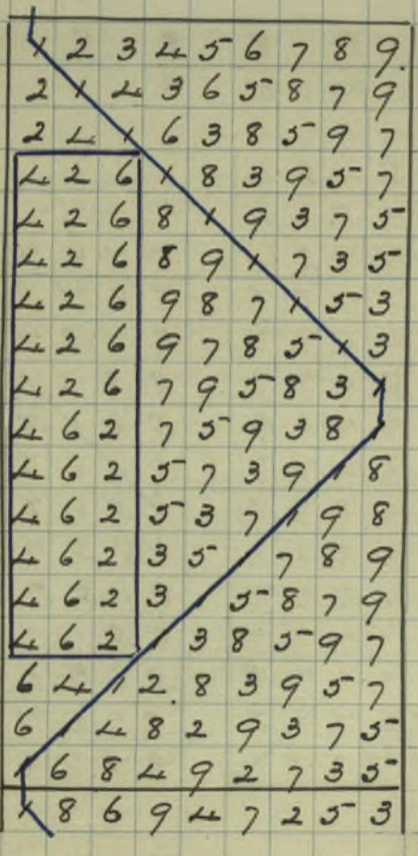


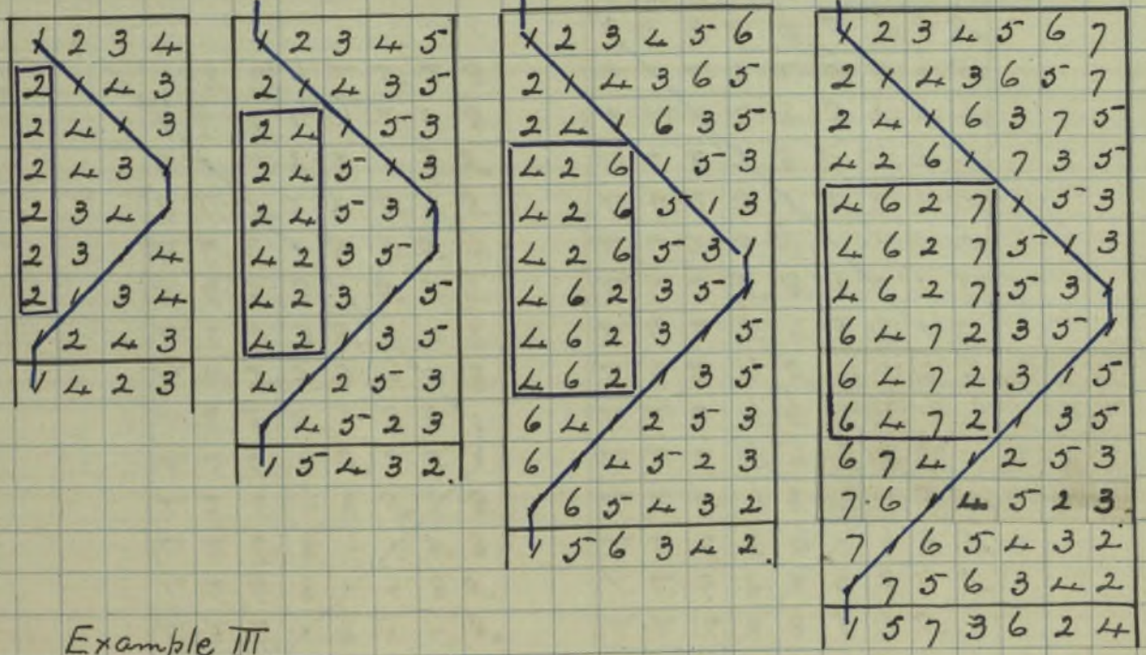


Example II

3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	Ad. inf.

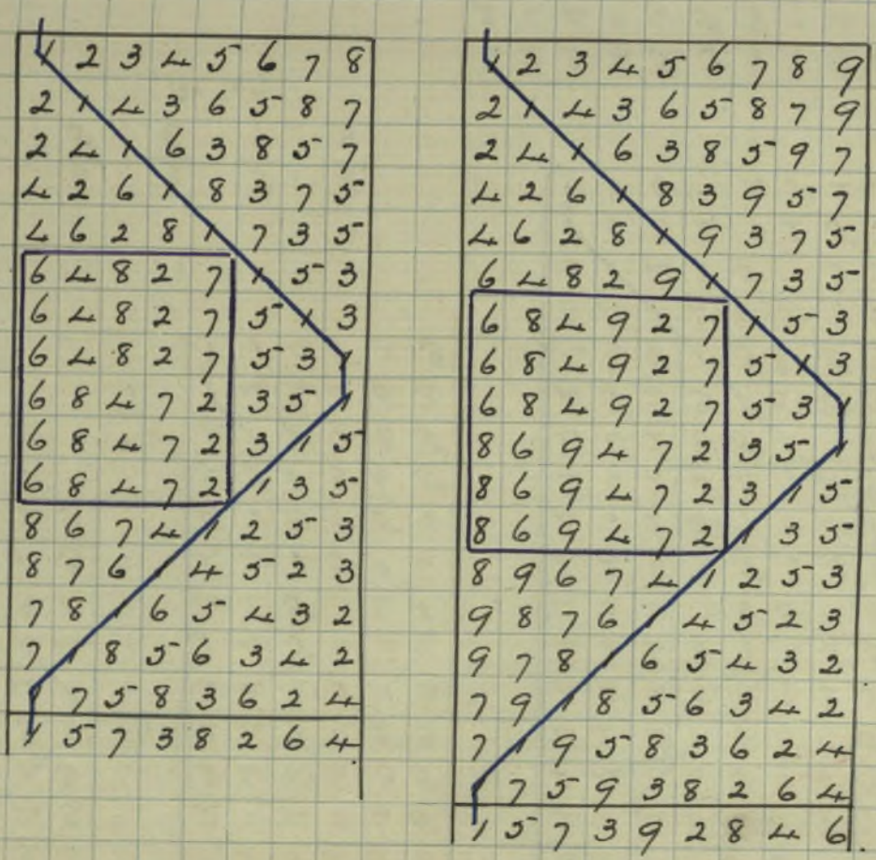


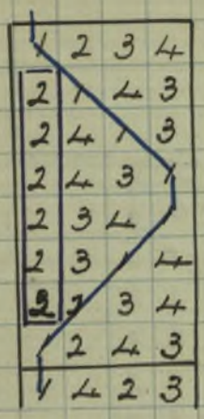


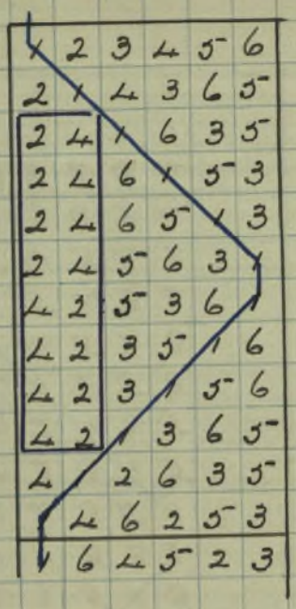


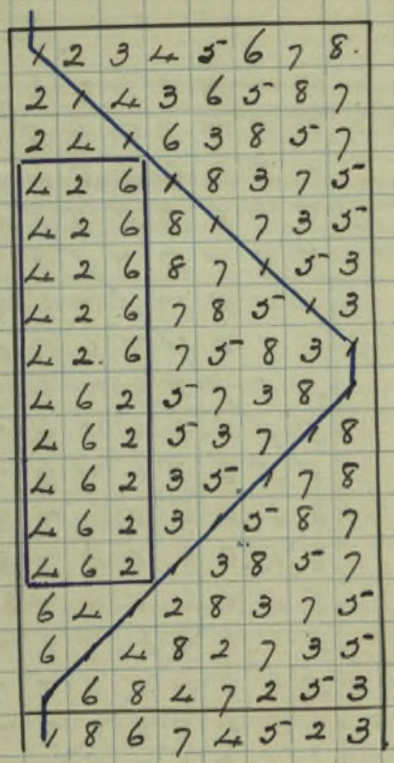
Example III

1/3	2/3	3/3	4/3	5/3	6/3	7/3	8/3	9/3	10/3	Ad. int.





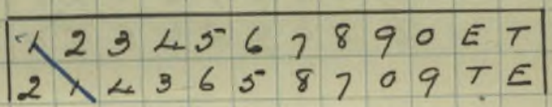


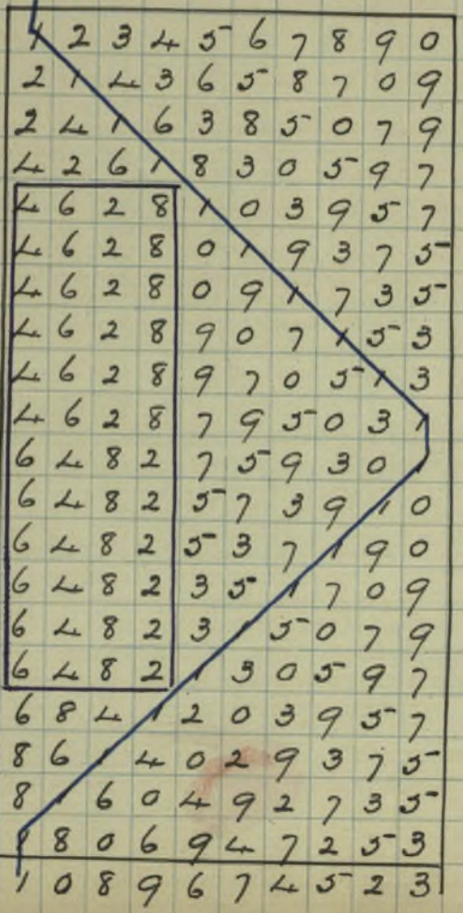


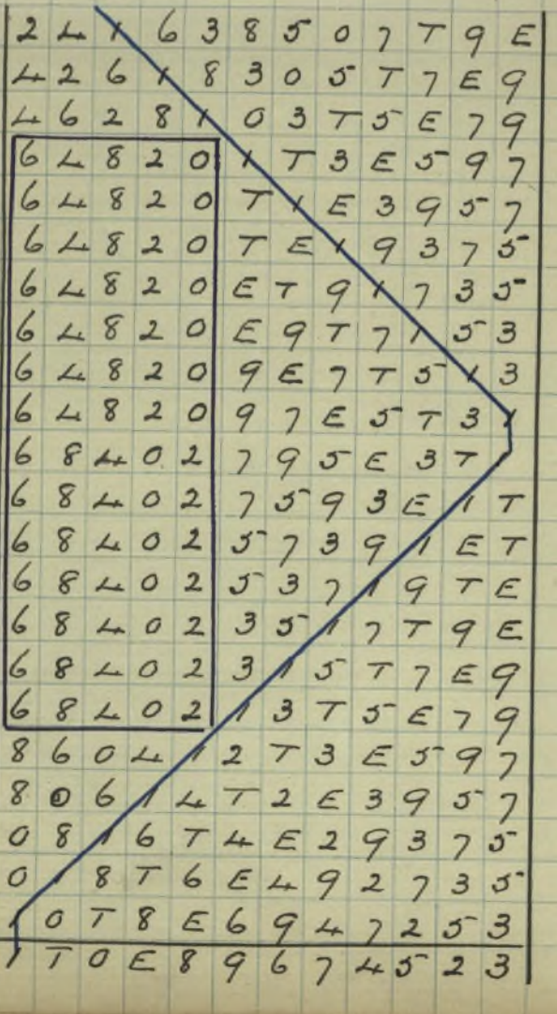
Example IV.

1	2	3	4	5	6
3	4	5	6	7	8

Ad. inf.







Note.

These two diagrams are similar in form and relative position of parts.

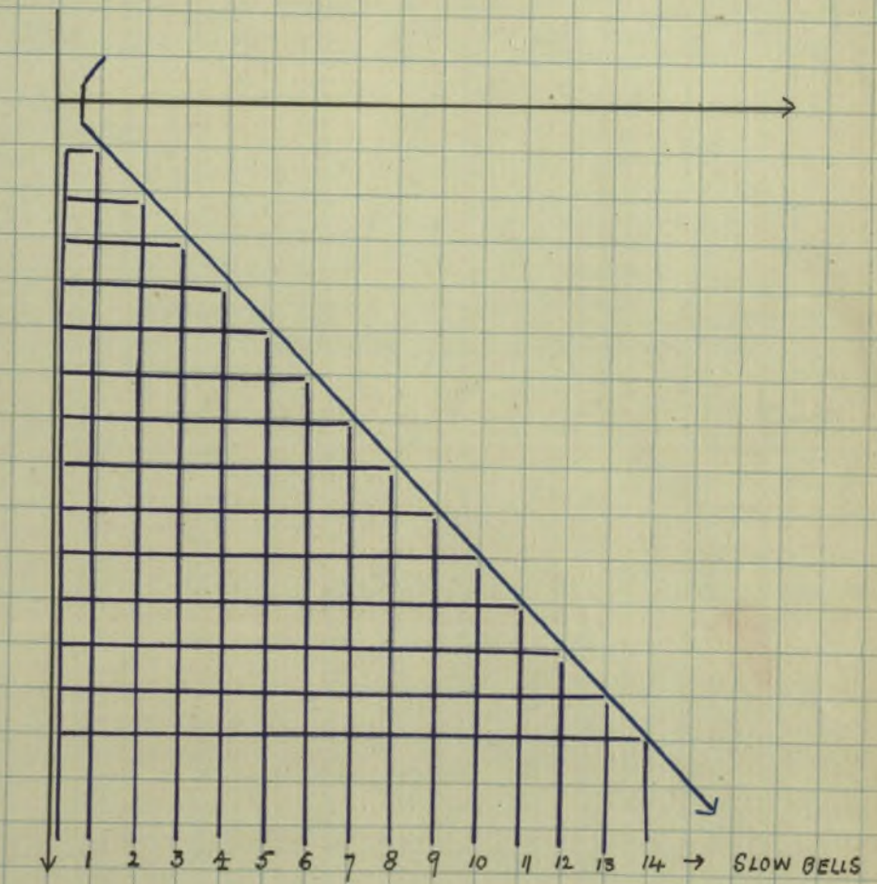
Should they not be "out of phase" ?

J. E.

The first (red lines) should ~~be~~ "raised" one whole row, I think.

A. J. B.

The SLOW WORK CONSTRUCTIONAL SHUNTS.
on all numbers of Bells from four
to infinity.



Ad inf.

Mixed Court Shunts and Slow Work Shunts.

In any Lead containing a Slow Work Shunt, the number of positions available for making Court Shunts depends solely on the number of Slow Work Bells and is irrespective of the total number of Bells.

No of SLOW BELLS	No of Positions of R. Ct. Shunts	No of Positions of P. Ct Shunts	Total No Positions of Court Shunts
1	0	0	0
2	0	1	1
3	1	1	2
4	1	2	3
5	2	2	4
6	2	3	5
7	3	3	6
8	3	4	7
9	4	4	8
10	4	5	9
11	5	5	10
12	5	6	11
13	6	6	12
14	6	7	13

Ad inf.

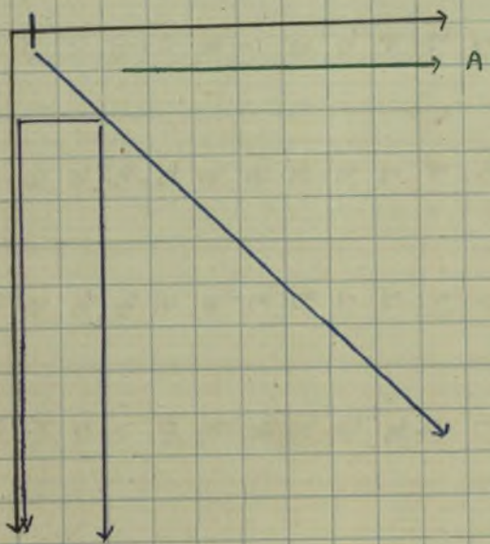
on all numbers of Bells.

The Court Shunts are with Hunt either ascending or descending.

Double the Nos. for both.

The total Number of mixed. SLOW WORK and COURT SHUNTS on all numbers of Bells.

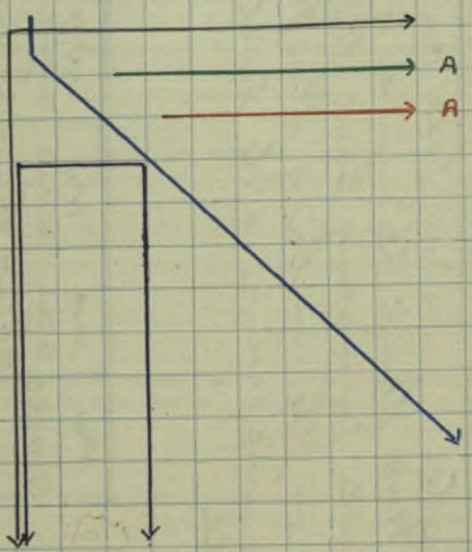
1. 2 Bell. S.W. Shunt.



Combinations

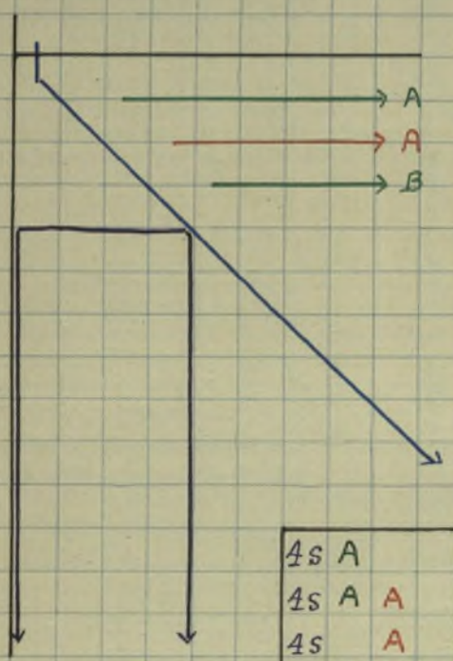
2sw A

2. 3 Bell. S.W SHUNT.



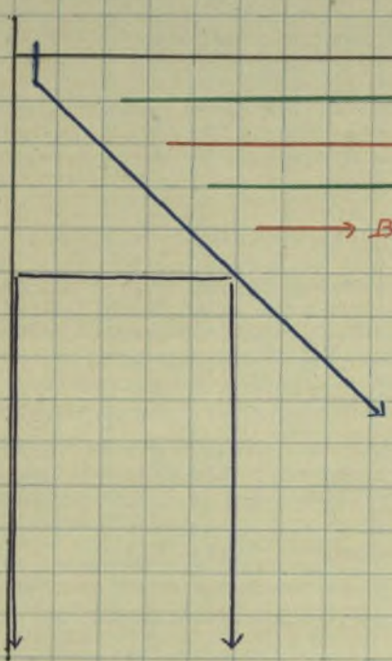
3sw	A	
3sw	A	A
3sw.		A

4. 3 Bell. S.W. Shunt.



4s	A		
4s	A	A	
4s		A	
4s	A	A	B
4s	A		B
4s		A	B
4s			B

5. 4 Bell. S.W. Shunt.



5s	A			
5s	A	A		
5s		A		
5s	A	A	B	
5s	A		B	
5s		A	B	
5s			B	
5s	A	A	B	B
5s	A	A		B
5s	A		B	B
5s	A			B
5s		A	B	B
5s		A		B
5s			B	B
5s				B

The formula given on page 315 will produce the total combinations of Court Shunts possible with all numbers of Slow Work Shunts to infinity.

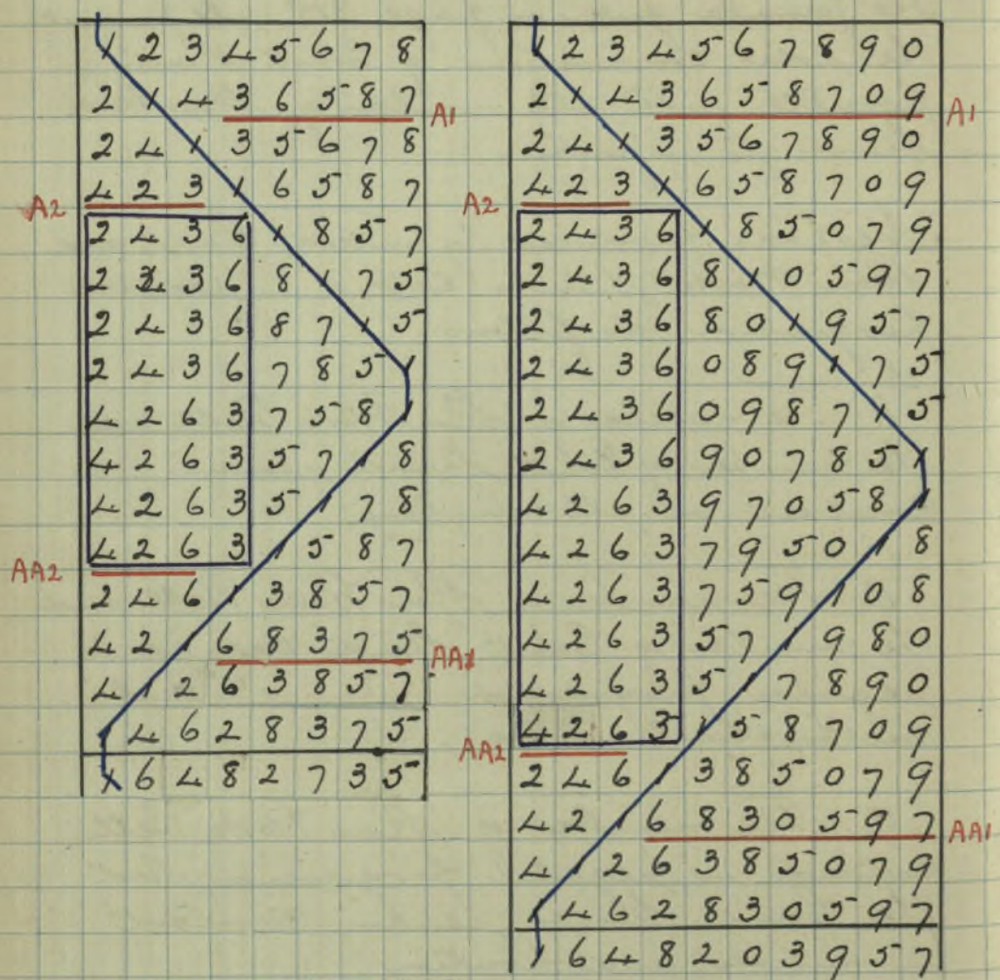
Methods produced by mixed Court and Slow Work Shunts extend in regular progression as follows.

A. The number of Slow Work Bells and the number of Court Shunts remain constant on all numbers;

B. The number of Slow Work Bells and the number of Court Shunts expand in regular progression and in equal arithmetical ratio;

C. The number of Slow Work Bells expands in regular progression, but the Court Shunts remain constant in number and position;

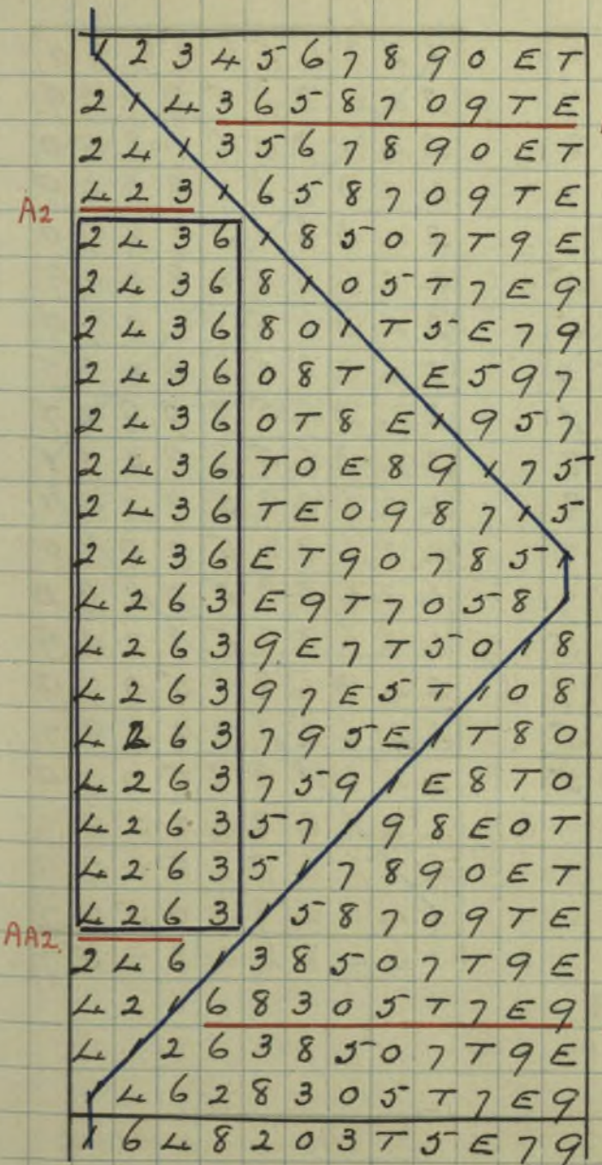
D The number of Slow Work Bells expands in regular progression; the Court Shunts remain constant in number but are altered in position in regular progression.

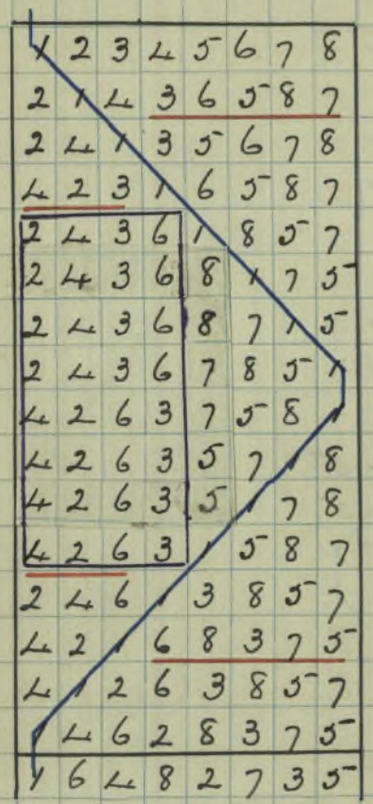


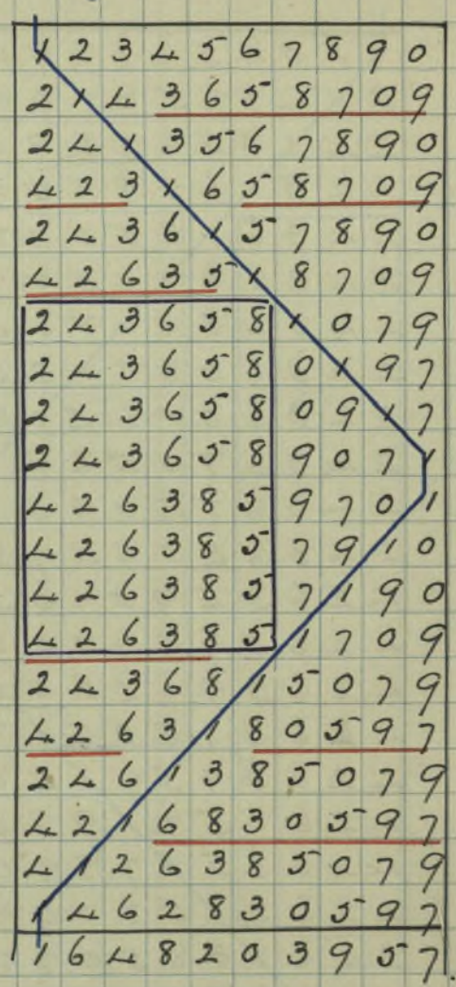
Example of Extension A.

A4SAA	A4SAA	A4SAA	A4SAA
7	9	11	13

Ad inf.

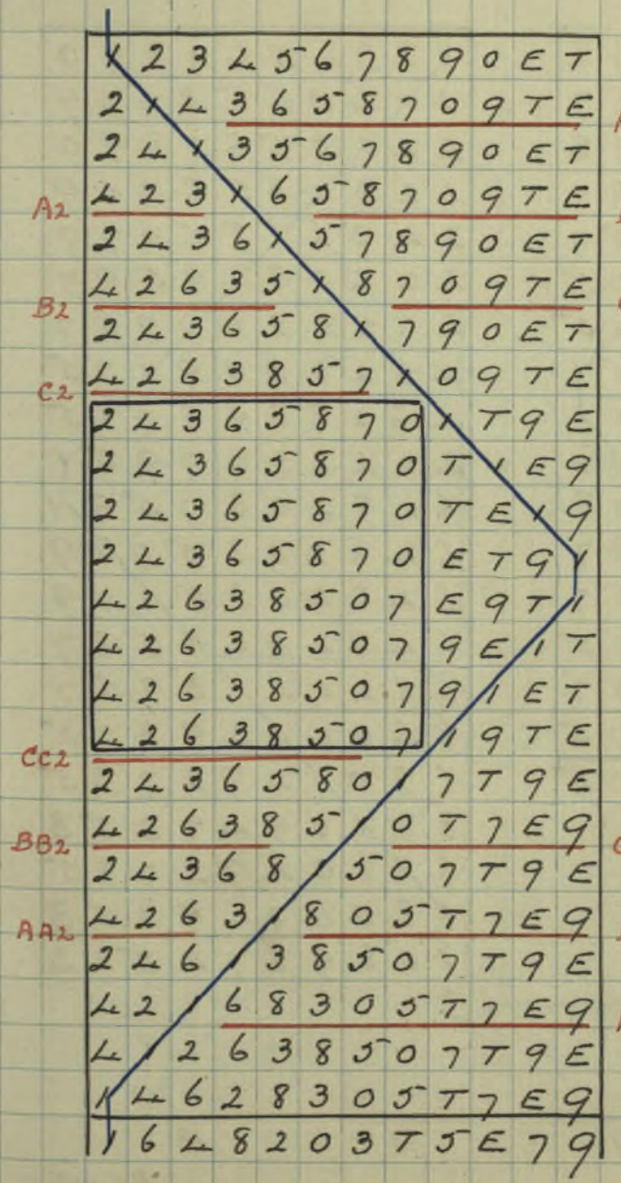


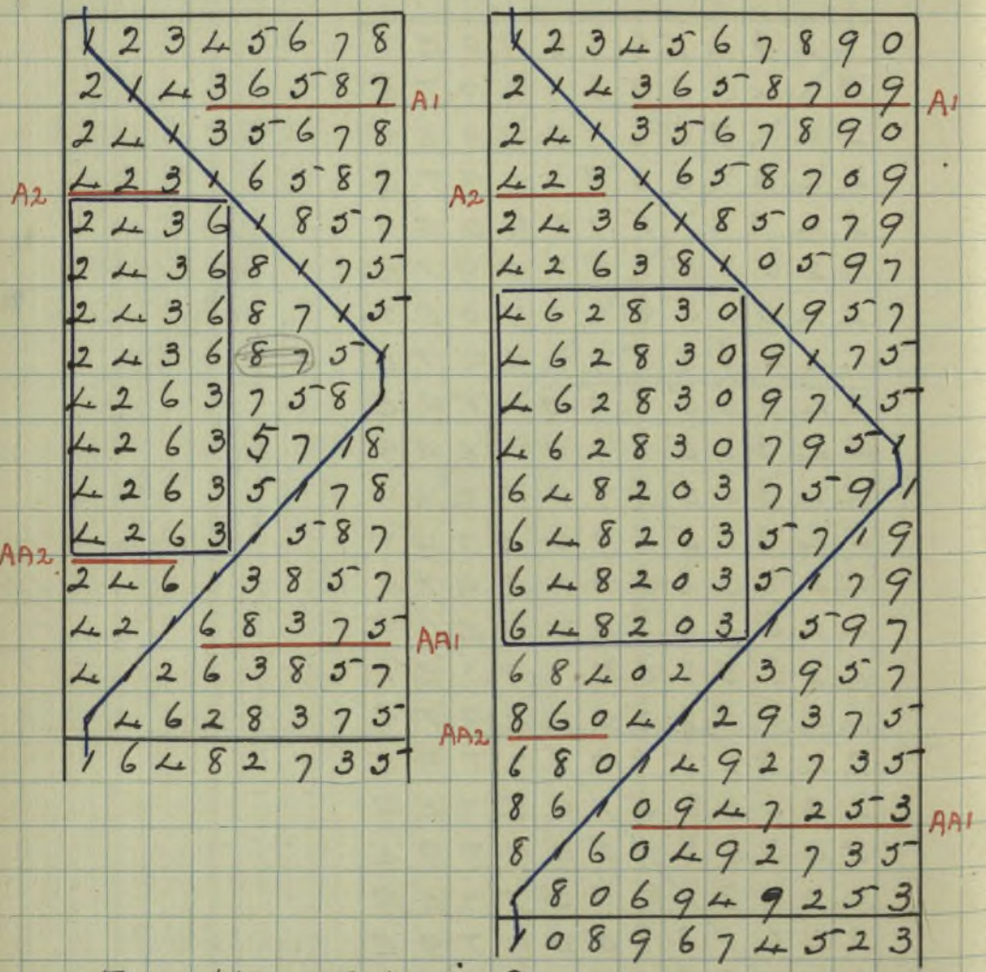




Example of
EXTENSION B.

A 4s. AA. 7 — AB 6s AA. BB. 9 — ABC 8s AA. BB. CC. 11 — Ad. inf.

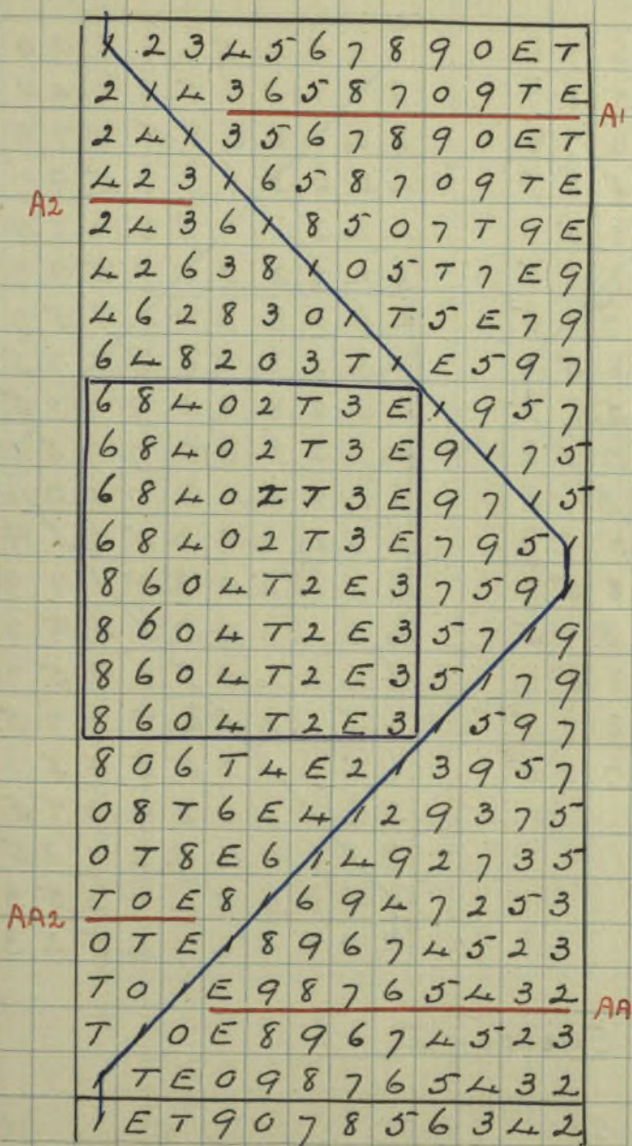


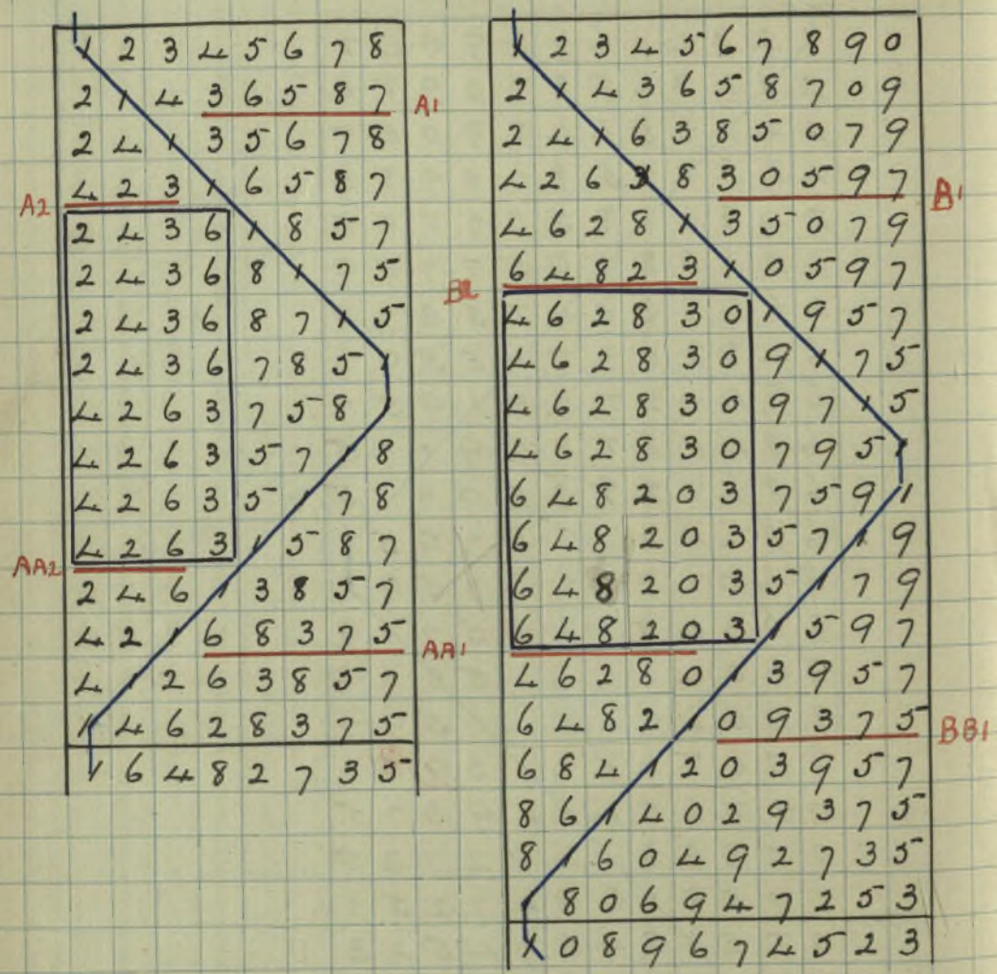


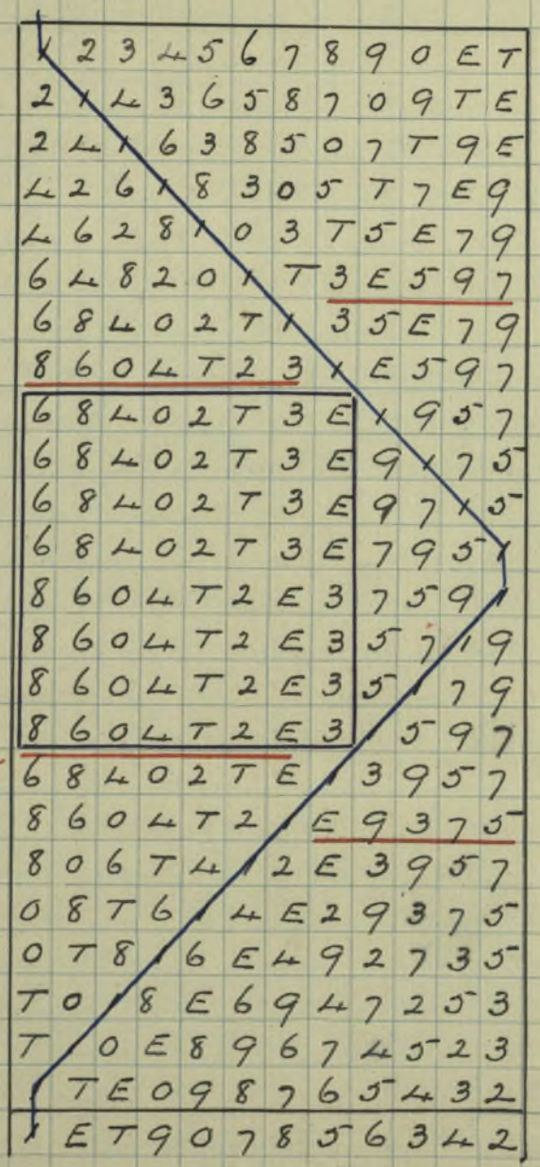
Example of Extension C.

A4s AA	A6s AA	A8s AA	A10s AA
7	9	11	13

Ad. inf.







Example of Extension D

$$\frac{A4SAA}{7} \cdot \frac{B6SBB}{9} \cdot \frac{C8SCC}{11} \cdot \frac{D10SDD}{13} \longrightarrow \text{Adint.}$$

Mixed Extreme Shunts, Count Shunts, and Slow Work Shunts.

To every Course produced by Count Shunts, Extreme Shunts can be added as follows:-

1. (A) With the Shunts at the Lead;
2. (B) With the Shunts behind;
3. (A)(B) With the Shunts at the Lead; and with the Shunts behind.

To every Course produced by Single Count Shunts, by Slow Work Shunts, or by mixed Count and Slow Work Shunts, (A) can be added, but not (B).

To every Course produced by Reverse Count Shunts, Reverse Slow Work Shunts, or by mixed Count and Reverse Slow Work Shunts, (B) can be added but not (A).

With the addition of these, the formulae given for Count and Slow Work Shunts, will produce every possible Constructional Shunt and Combination of Constructional Shunts, on the Plain Principle, or all numbers to infinity. Some of these combinations will produce one Lead only, others a block less than a full Course but in all cases the Shunts Cyclical path is complete.*

In any Combination of Shunts, the number of Extreme Bells in each Shunt must

* See p. 187.

(a) DOUBLE OXFORD BOB

be the same.

Combinations of Exterior Shunts, Court Shunts, and Slow Work Shunts, extend exactly similarly to the Extensions already described. Examples;—

(a)

A (B) AA (A) / 5 — A (B) AA (A) / 7 — A (B) AA (A) / 9 — A (B) AA (A) / 11 →

A (B) AA (A) / 5 — B (B) BB (A) / 7 — C (B) CC (A) / 9 — D (B) DD (A) / 11 →

A (B) AA (A) / 5 — A B (B) AA BB (A) / 7 — A B C (B) AA BB CC (A) / 9 →

A (B) AA (A) / 5 — B (B) BB (A) / 9 — C (B) CC (A) / 13 — D (B) DD (A) / 15 →

A 4S AA (A) / 7 — A 4S AA (A) / 9 — A 4S AA (A) / 11 — A 4S AA (A) / 13 →

A 4S AA (A) / 7 — A B 6S AA BB (A) / 9 — A B C 8S AA BB CC (A) / 11 →

A 4S AA (A) / 7 — A 6S AA (A) / 9 — A 8S AA (A) / 11 — A 10S AA (A) / 13 →

A 4S AA (A) / 7 — B 6S BB (A) / 9 — C 8S CC (A) / 11 — D 10S DD (A) / 13 →

As the Exclusive, Court, and Slow Work Constructional Shunts apply to the Treble Bob Principle exactly in the same way that they do to the Plain Principle, the explanations just given will so far apply to the Extension of Treble Bob Methods. The Constructional Shunts peculiar to the Treble Bob Principle are all variations of these Constructional Shunts, and extend similarly. I will presently give some examples.

The Extension of Additional Shunts.

Every Additional Shunt consists of either,
(a) a Hunting Course on five or more bells;
(b) a Dodging Movement on five or more bells;
(c) a Combination of Hunting Courses, or of Hunting Courses and Dodging Movements.

Every Hunting Course can expand in regular progression as the difference in the number of bells involved.
Every Dodging Movement can expand in

regular progression.

The expansion of the Principle, and of the Constructional Shunts, gives more bells to make Additional Shunts and more room to make them in.

Therefore, prima facie, it is probable that an Additional Shunt can expand as follows:-

1. It may increase in size by adding to the number of bells taking part in it;

2. It may remain constant in size, number, and position;

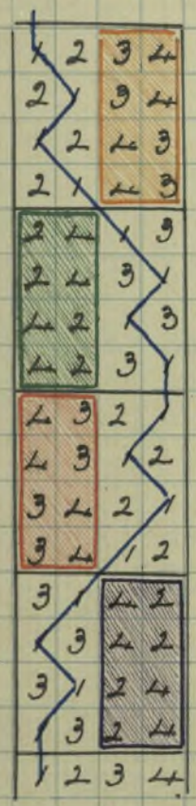
3. It may remain constant in size and number, but be altered in position in a regular progression;

4. It may remain constant in size, but increase in number in regular progression.

But since the expansion of the Principle and of the Constructional Shunts is necessarily in a different ratio to the expansion of any Additional Shunt, the capacity of the latter for expansion is very much restricted.

There is one general Law for the extension of Additional Shunts, which adapts itself

to the different Conditions produced by the Principle and the Conditional Shunts.



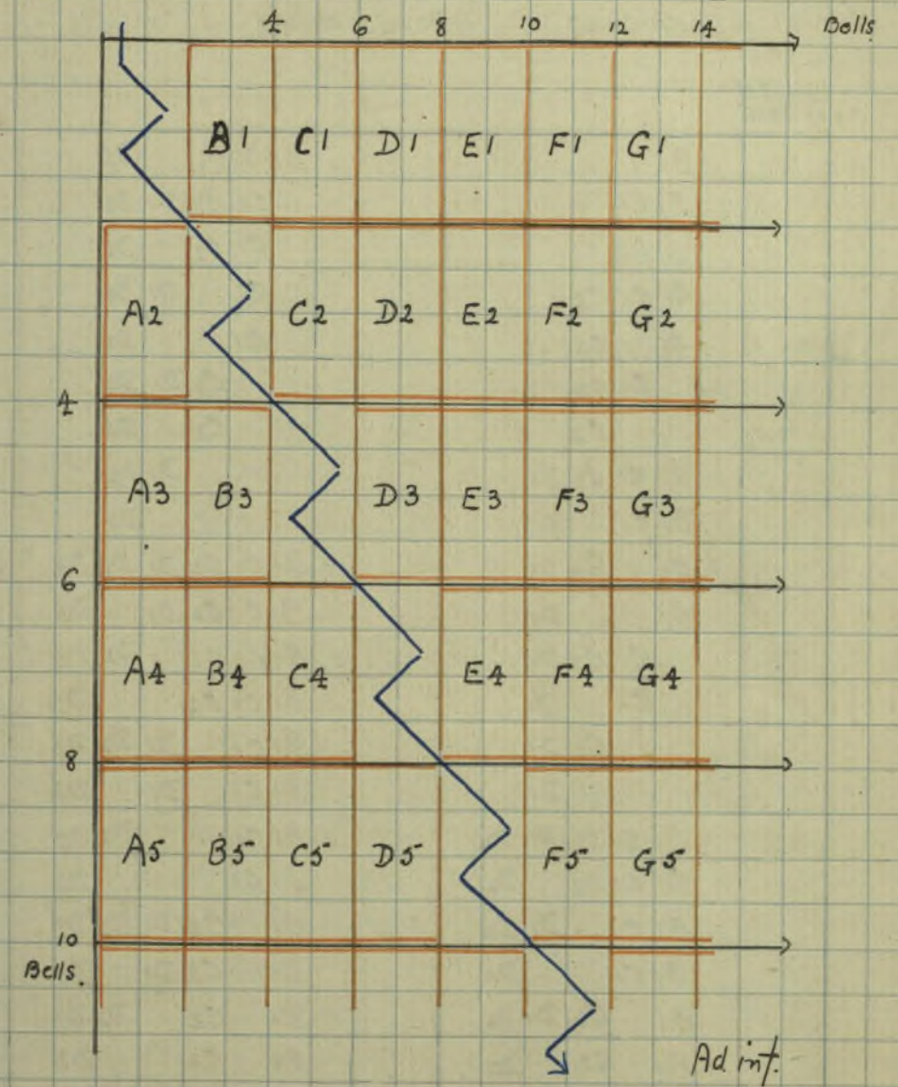
A is a Lead produced by the Treble Bob Principle in each Division of which a 2-Bell Hunting Course Additional Shunt is made, the object and effect of which is to get rid of the repetition of Rows caused by the Principle.

The Principle extends in a regular progression. In what way can the Additional Shunt extend?

The Extension of the Principle increases the size of the Division longitudinally, but leaves it constant vertically. Therefore the Add: Shunt cannot expand in size.

The Extension of the Principle not only increases the size of the Divisions longitudinally, but also increases the number of Divisions, and therefore increases in regular progression the number of positions in which 2-Bell Add: Shunts can be made.

Two-Bell Hunting Course Add: Shunts (Kent Add: Shunts) applied to a Method on the Treble Bob Principle.



COMBINATIONS of KENT ADD: SHUNTS applied to the TREBLE BOB PRINCIPLE

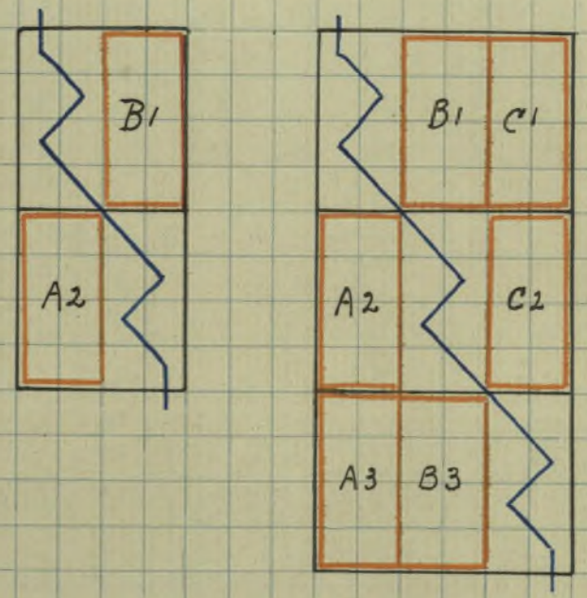
HUNT ASCENDING ABOVE HUNT.

Limit of No of Bells.		
4	B1.	B1 C1 D2
	B1 C1	C1 C2 D1 D2
	C2.	C1 C2 D2
	B1 C1 C2	C1 D1 D2
	B1. C2	C1 D2
	C1 C2	C2 D1 D2
6.	C2	C2 D1
	B1 C1 C2 D1	D1 D2
	B1 C1 D1	D2
	B1 C2 D1	B1 C1 C2 D1 D2 D3
	B1 D1	B1 C1 C2 D1 D3
	C1 C2 D1	B1 C1 C2 D2 D3
	C1 D1	B1 C1 C2 D3
	C2 D1	B1 C1 D1 D2 D3
	D1	B1 C1 D1 D3
	B1 C1 C2 D1 D2	B1 C1 D2 D3
	B1 C1 C2 D2	B1 C1 D3
	B1 C1 D1 D2	B1 C2 D1 D2 D3
	B1 C1 D2	B1 C2 D1 D3
	B1 C2 D1 D2	B1 C2 D2 D3
	B1 C2 D2	B1 C2 D3
	B1 D1 D2	Ad Int.

HUNT ASCENDING BELOW HUNT.

4	A2	A2 B4
	A2 A3	A3 B3 A4 B4
	A3	A3 B3 B4
	A2 A3 B3	A3 A4 B4
	A2 B3	A3 B4
	A3 B3	B3 A4 B4
6.	B3	B3 B4
	A2 A3 B3 A4	A4 B4
	A2 A3 A4	B4
	A2 B3 A4	A2 A3 B3 A4 B4 C4
	A2 A4	A2 A3 B3 A4 B4 C4
	A3 B3 A4	A2 A3 B3 B4 C4
	A3 A4	A2 A3 B3 C4
	B3 A4	A2 A3 A4 B4 C4
	A4	A2 A3 A4 C4
	A2 A3 B3 A4 B4	A2 A3 B4 C4
	A2 A3 B3 B4	A2 A3 C4
	A2 A3 A4 B4	A2 B3 A4 B4 C4
	A2 A3 B4	A2 B3 A4 C4
	A2 B3 A4 B4	A2 B3 B4 C4
	A2 B3 B4	A2 B3 C4
	A2 A4 B4	/ Ad Int.

Each term in the table for the Hunti above the Hunti can be used with every one of the terms in the table for the Hunti below the Hunti; giving on the higher numbers an immense number of combinations. To obtain the combinations with the Hunti descending reverse the diagram and use the same tables.



Neither $\frac{B1}{6}$ nor $\frac{C1}{6}$ nor $\frac{C2}{6}$ nor $\frac{B1C1}{6}$ nor $\frac{C1C2}{6}$ nor $\frac{B1C1C2}{6}$ is exactly the same as $\frac{B1}{4}$; but each is equally an equivalent. We get therefore the following Extensions;—

B1	B1	B1	B1	B1	B1	B1	B1	B1	⟶ Ad inf.
4	6	8	10	12	14	16	18	20	

B1	C1	D1	E1	F1	G1	H1	J1.	K1	⟶
4	6	8	10	12	14	16	18	20	

B1	C2	D3	E4	F5	G6	H7	J8	K9	⟶
4	6	8	10	12	14	16	18	20	

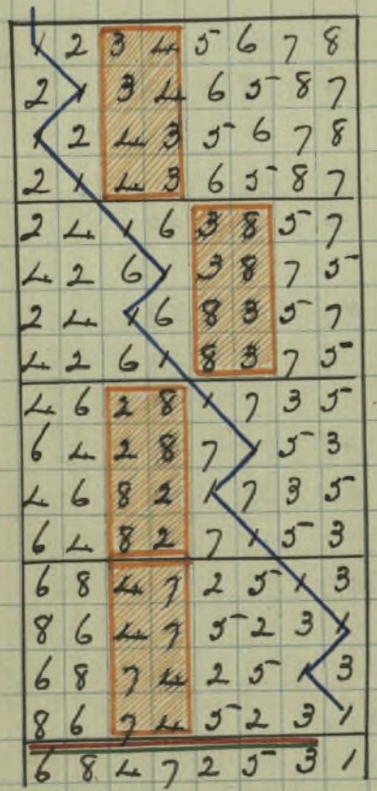
B1	C2	D3	E4	F5	G6	H7	J8	K9	⟶
4	8	12	16	20	24	28	32	36	

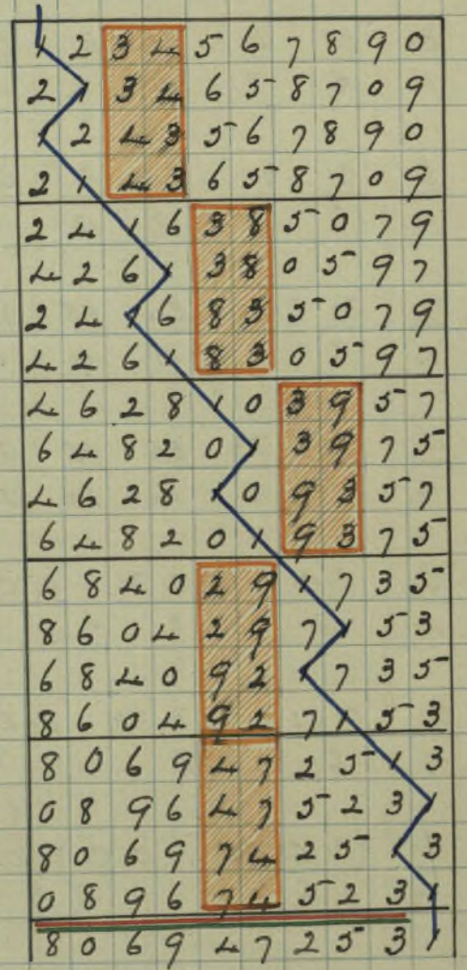
B1	B1 C1	B1 C1 D1	B1 C1 D1 E1	⟶
4	6	8	10	

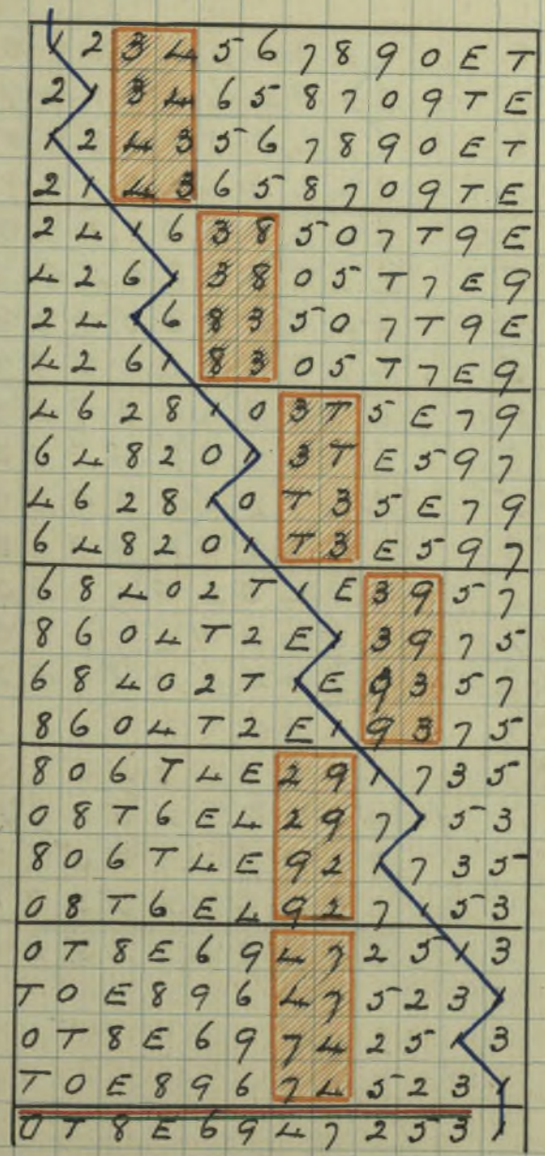
B1	C1 C2	D1 D2 D3	E1 E2 E3 E4	⟶
4	6	8	10	

B1	B1 C1 C2	B1 C1 D1 C2 D2 D3	⟶ Ad inf.
4	6.	8	

The following are two examples of Excisions from Table on page 341. The Constructional Units are the two Excisions (A) and (B).





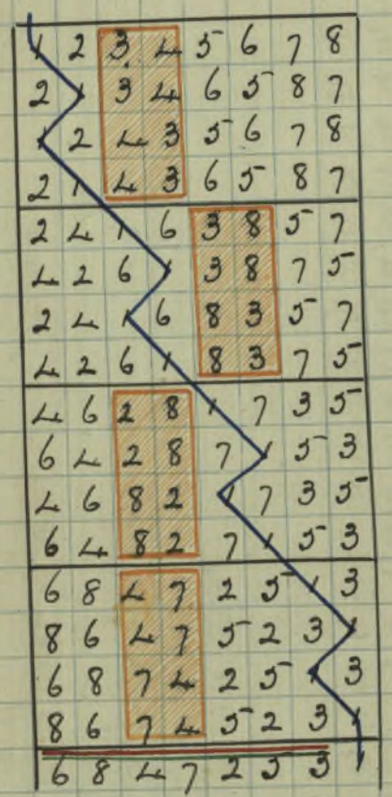


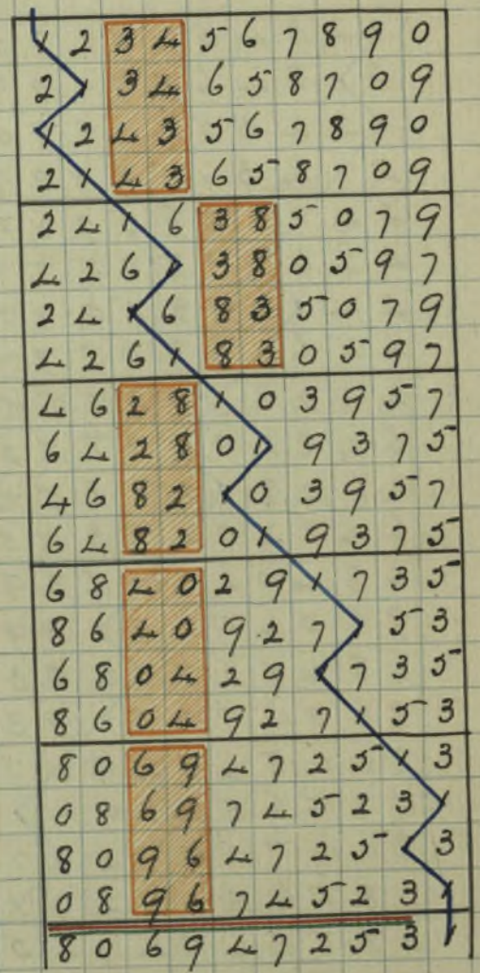
Ad. inf.

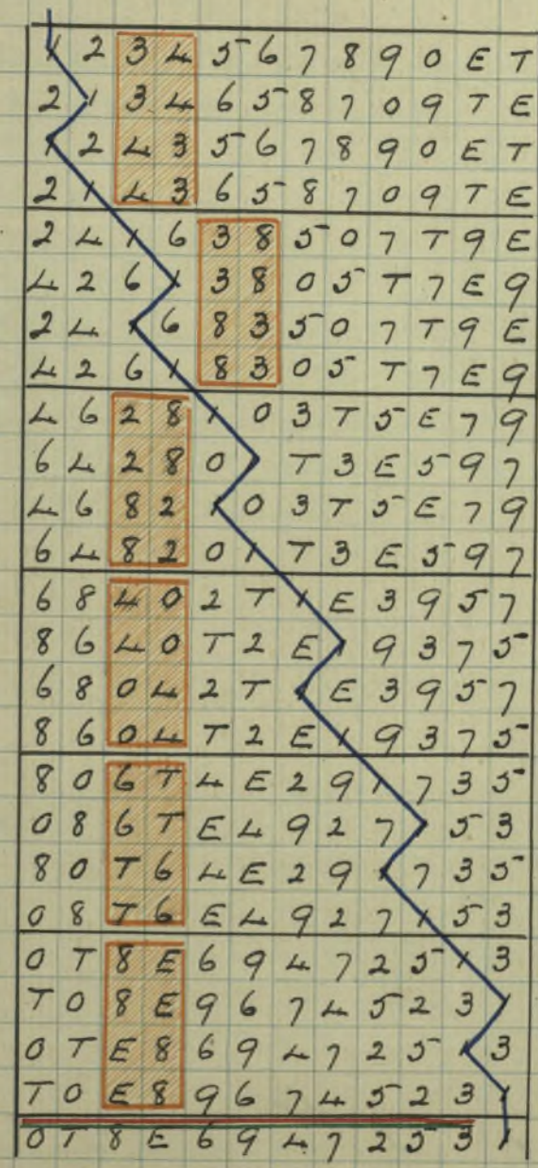
$$\langle A,B\rangle + B_1\,C_2 \;\backslash\; B_3\,B_4 \qquad 7$$

$$\langle A,B\rangle + B_1\,C_2\,D_3 \;\backslash\; C_4\,C_5 \qquad 9$$

$$\langle A,B\rangle + B_1\,C_2\,D_3\,E_4 \;\backslash\; D_5\,D_6 \qquad 11$$







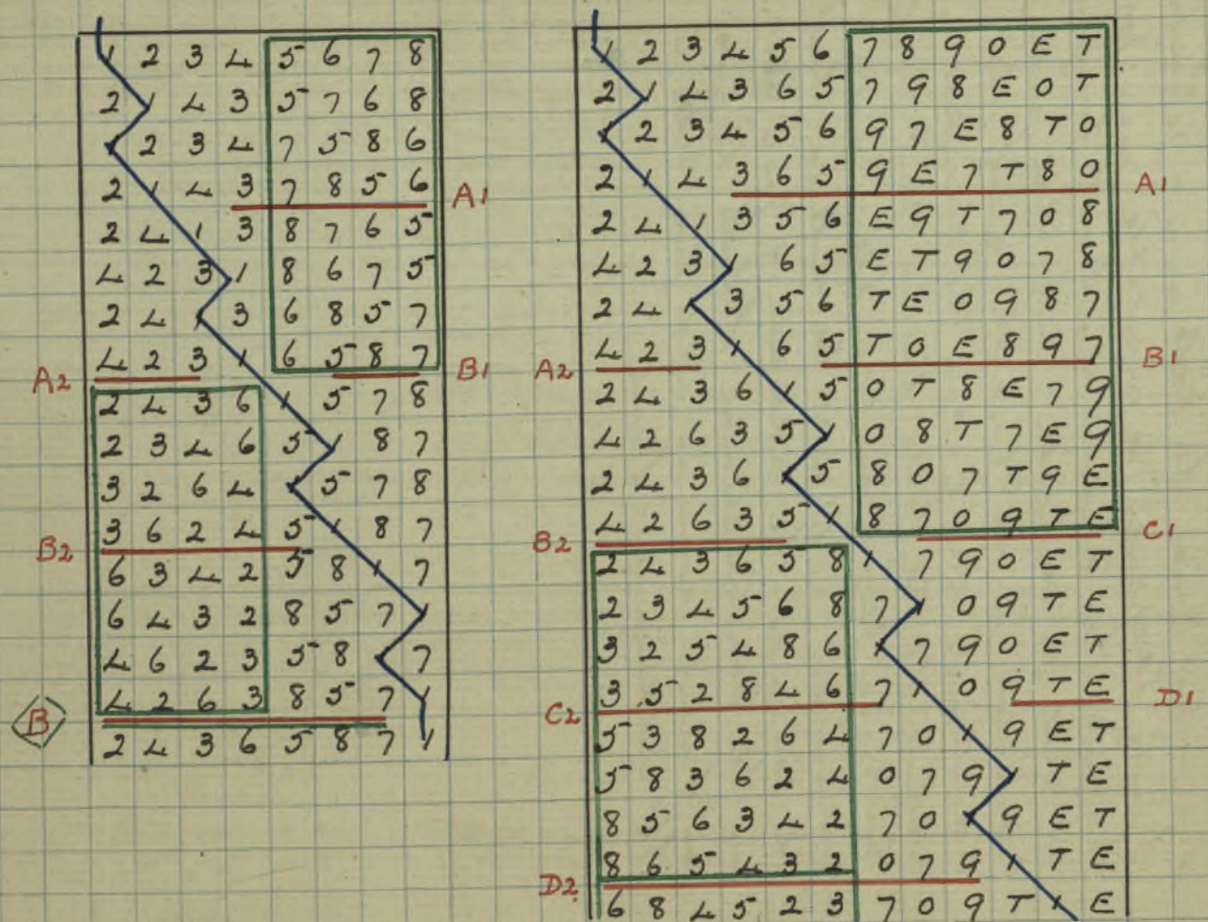
Ad int.

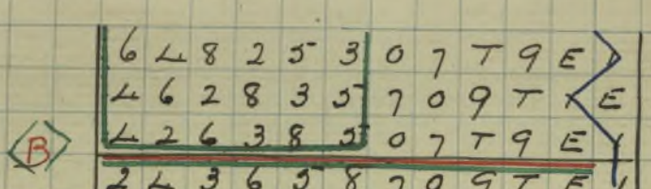
$\langle A \rangle + \boxed{B1}\boxed{C1} \mid \boxed{B3}\boxed{B4}$
7

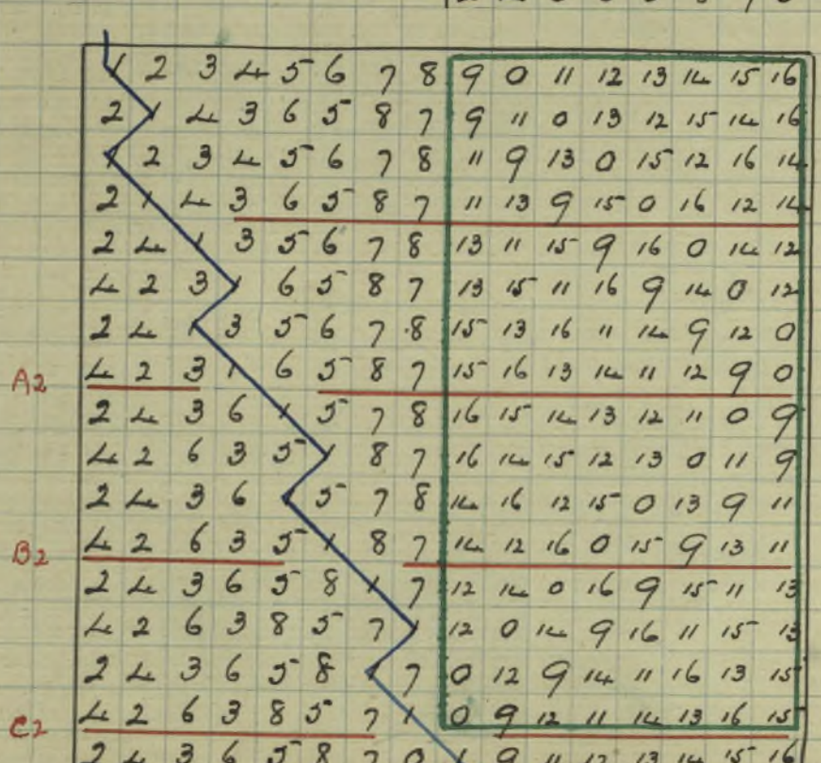
$\langle A \rangle + \boxed{B1}\boxed{C1} \mid \boxed{B3}\boxed{B4}\boxed{B5}$
9

$\langle A \rangle + \boxed{B1}\boxed{C1} \mid \boxed{B3}\boxed{B4}\boxed{B5}\boxed{B6}$
11

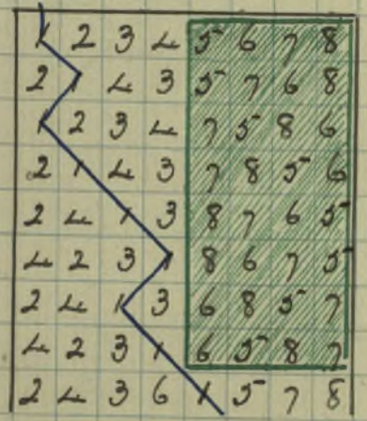
In many cases the extension of the Constructional Shunts expand the available room for making the Additional Shunt longitudinally as well as vertically; and when such expansion is sufficiently great, the Additional Shunt can be extended by adding to the bells taking part in it. On page 347 is an example of such expansion. It will be noticed that it requires the addition of four bells in the Constructional Shunts to give sufficient room to add two bells to the Additional Shunt.

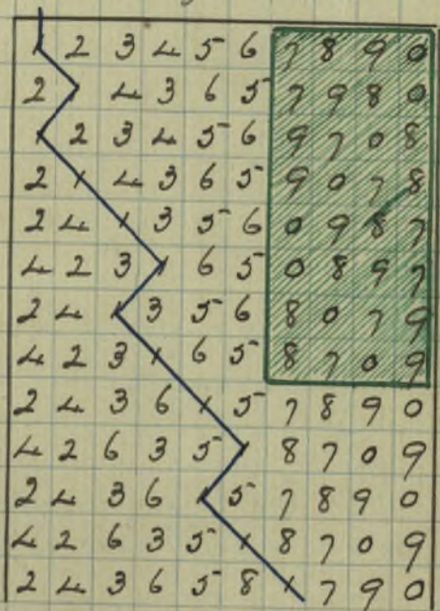

A1
B1
A2
B2
(B)
A1
B1
A2
B2
C1
C2
D1
D2


(B)


A1
B1
A2
B2
C1
C2
D1

The Additional Shunts, illustrated on page 347, can remain Constant in size on all numbers of bells. The Extension of the number of Shunts, and their position will then be similar to that of the KENT Shunts illustrated on page 340, adapted to the increased room supplied by the Constructional Shunts. In many such cases the expansion will not be great enough to remove the falseness of the Treble Bob Principle. As for example.

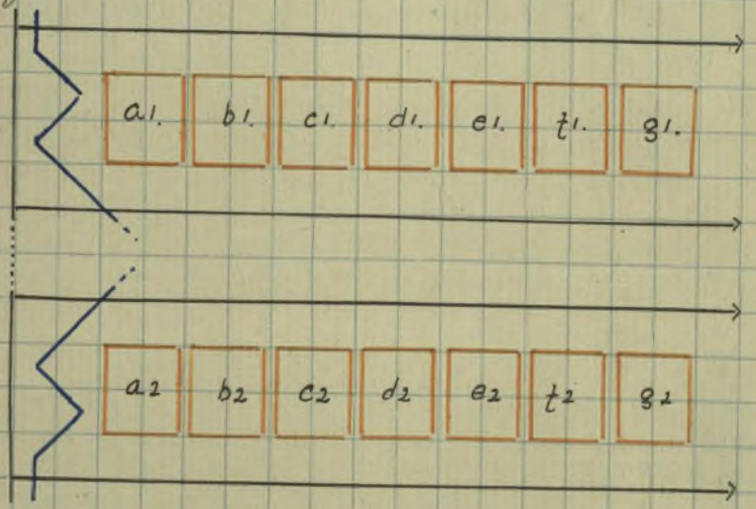




The backward hunting of the four kind bells

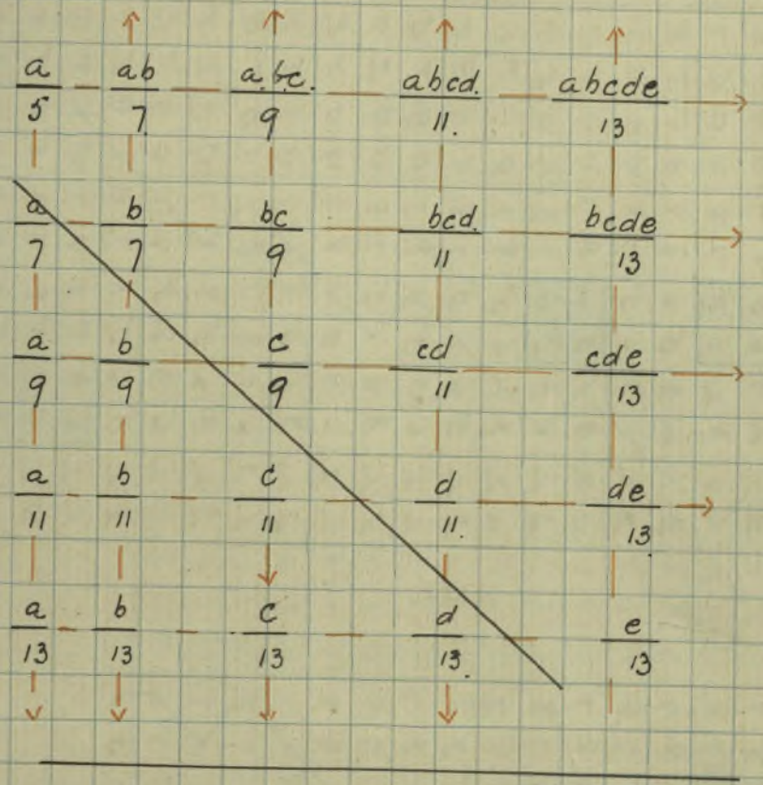
Cannot be continued in the Changes marked x.; for that would mean beginning a fresh Additional Shunt, and there is not room enough to complete it.

Additional Shunts consisting of Hunting Courses, in which the members are separated, extend according to the same law as those in which the members come all together.

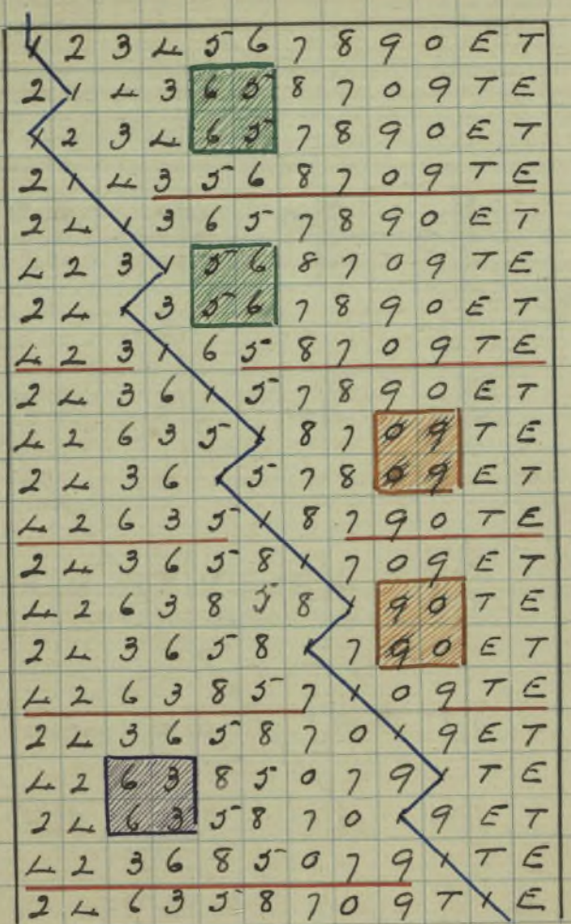


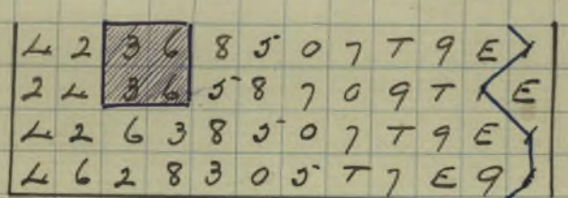
The above are the positions in which the additional Shunts of Oxford Treble Bob can be made. The following show their Extension.

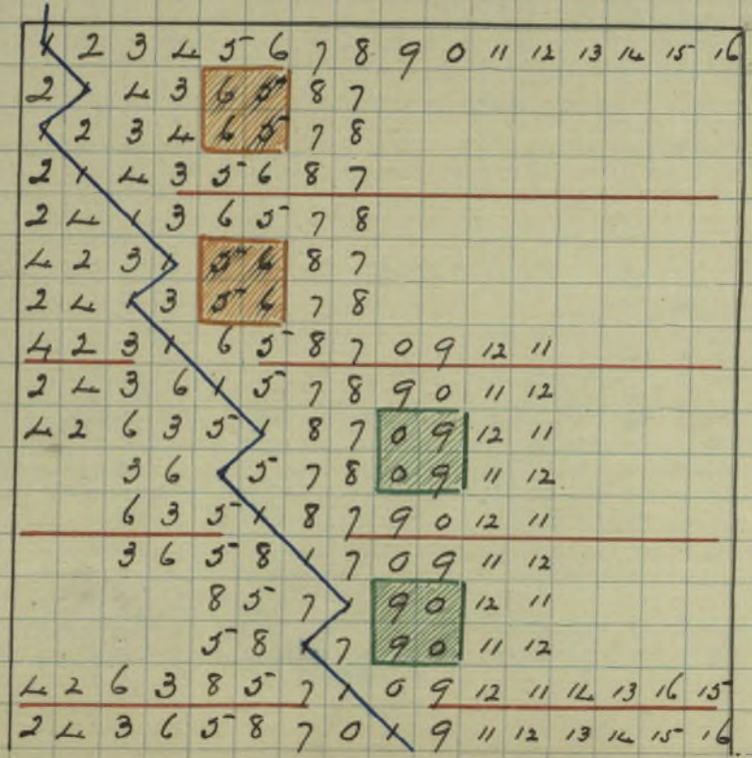
The Extension of the OXFORD ADDITIONAL SHUNT. applied to Treble Bob.



The next example shows how the expansion of the Constructional Shunts will allow the number of Additional Shunts to be increased. Notice that to allow the Additional Shunts to be doubled, the Extreme Bells must be increased by four.







A Dodging Movement on x bells consists of y steps of Forward Hunting, followed by y steps of Backward Hunting. Or of y steps of Backward Hunting, followed by y steps of Forward Hunting. This will expand by adding to x in regular progression; or to y in regular progression; or to both x and y.

It follows, that an Additional Stunt which consists of a Dodging Movement can, prima facie, extend as follows —

1. By adding to the number of bells involved;

2. By increasing the number of steps of Forward and Backward Hunting;

3. By adding to the number of bells, and also increasing the number of steps of Backward and Forward Hunting;

4. The Stunt may remain constant in size number, and position;

5. The Stunt may remain constant in size and number, but the position be altered in regular progression;

6 The Stunt may remain constant in size, but increase in number in regular progression.

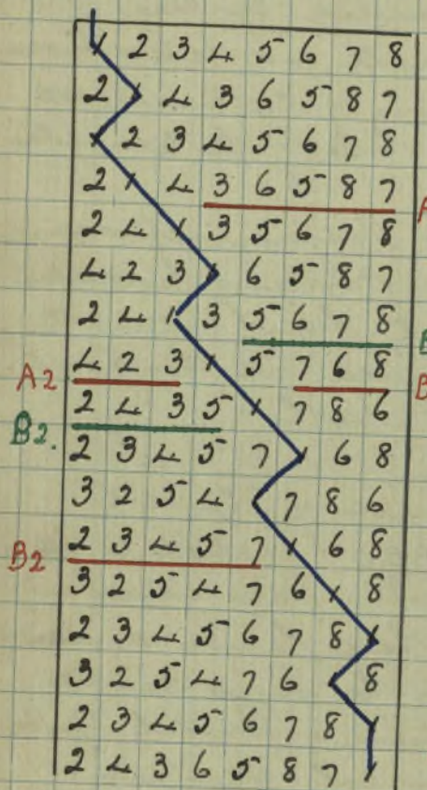
In any particular method this power

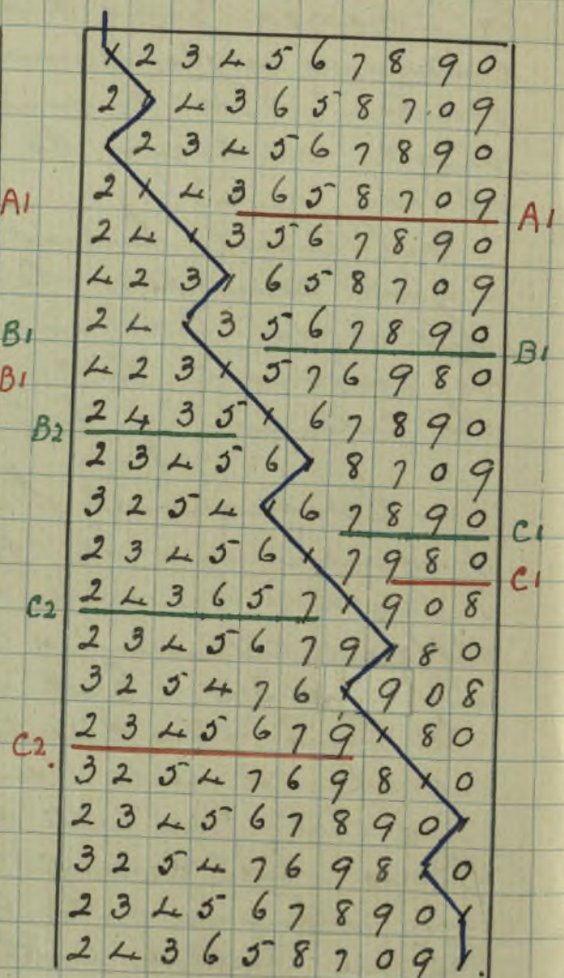
of expansion is conditioned by the amount of increased room provided by the extension of the Principle and the Constructional Shunts. The conditions of extension are strictly analogous to those of the examples already given.

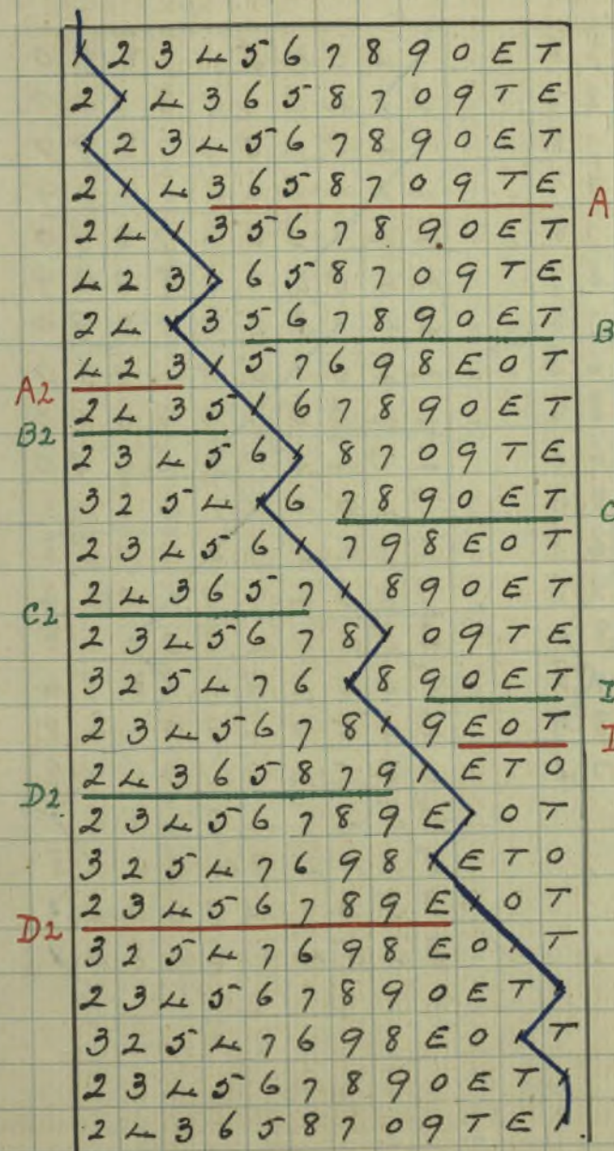
As Bristol Surprise Major includes a good example of the Dodging Movement used as an Additional Shunt, it will be convenient to consider at this point the extension of that Method.

The Constructional Shunts of Bristol Surprise Major are $\frac{A\,B\,B}{7}$ applied to the Treble Bob Principle. There are seven different extensions of these Shunts as shewn on page 316. Each of the seven can be the basis of an extension of Bristol Major but when we write them out we shall find that four will contain repetition of Rows which cannot be remedied by any extension of the Additional Shunts. They are therefore worthless for practical purposes, but interesting as examples of Extension.

The Constructional Shunts of BRISTOL SURPRISE







Extension A.

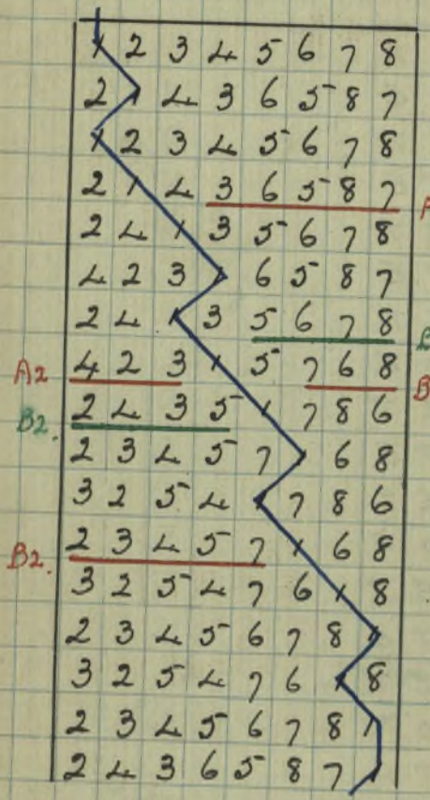
ABB / 7

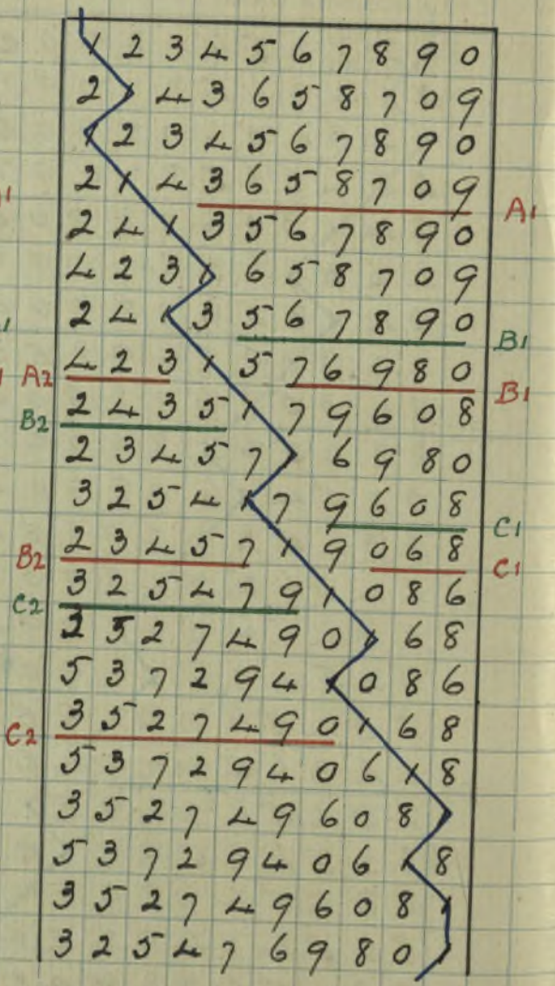
ABCC / 9

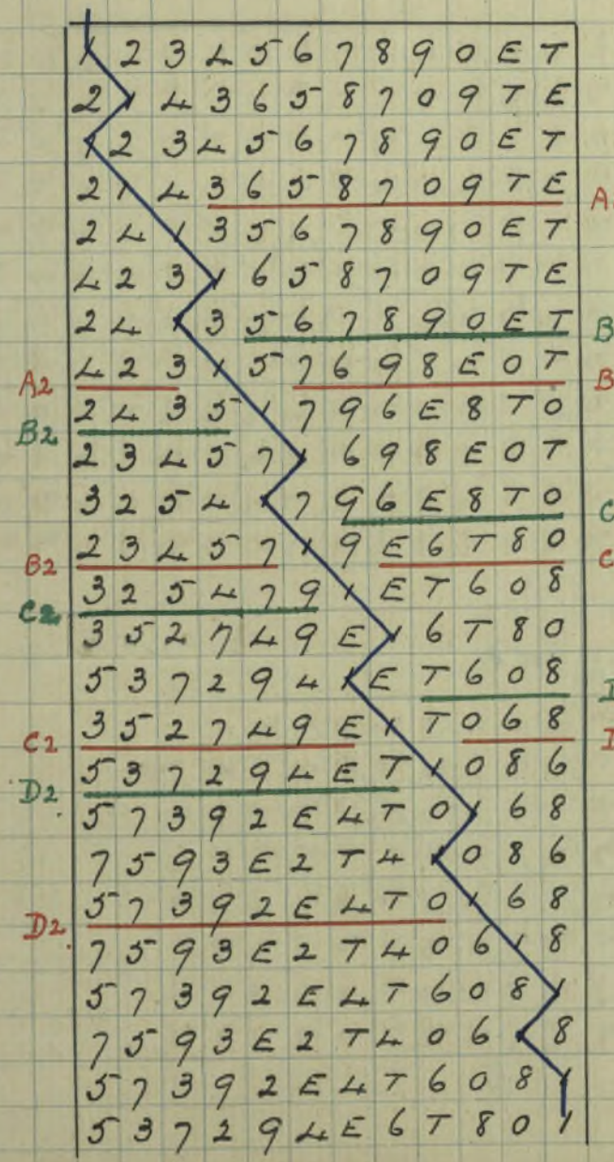
ABCDD / 11

ABCDEE / 13

Ad. inf.







Extension B.

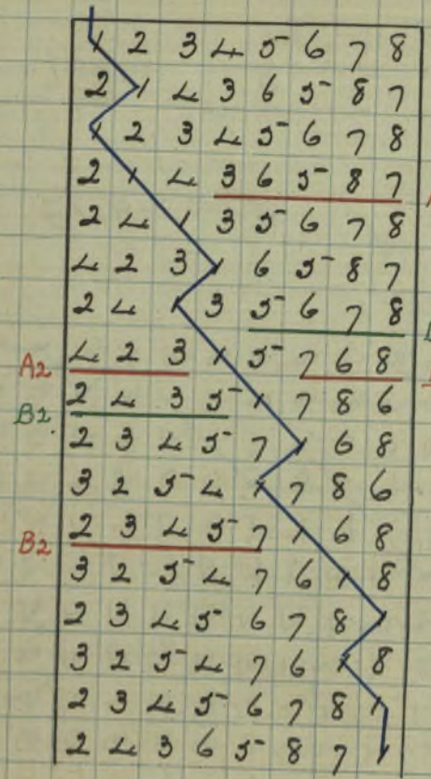
A	B	B	C	C	D	D	E	E
								13

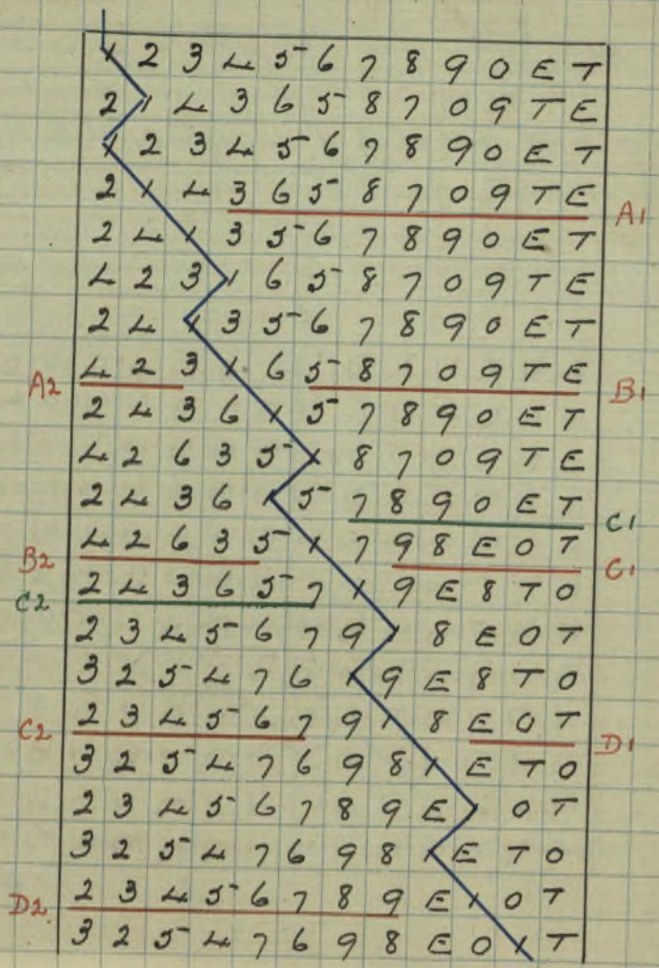
A	B	B	C	C	D	D
						11

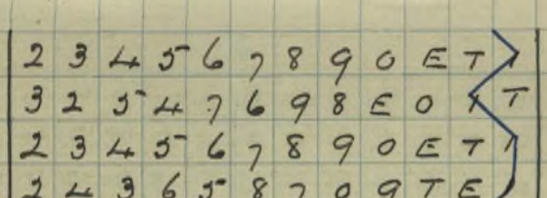
A	B	B	C	C
				9

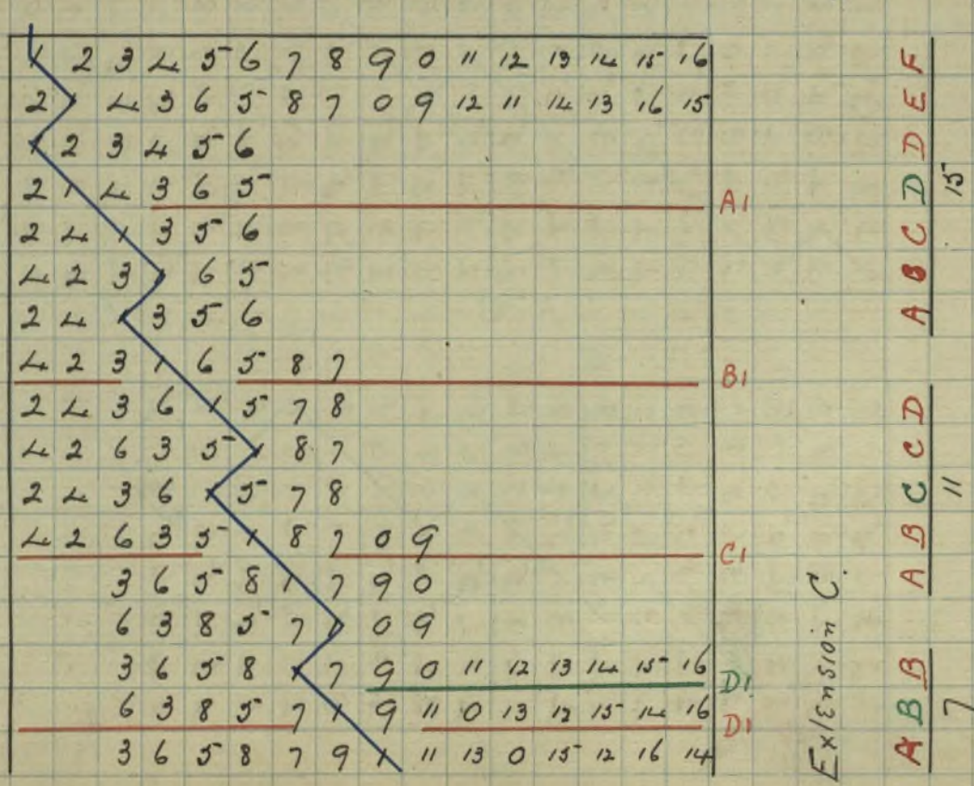
A	B	B
		7

Ad. int.







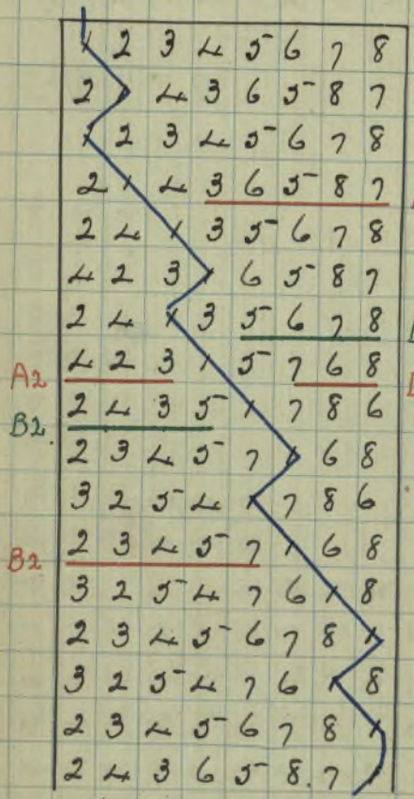


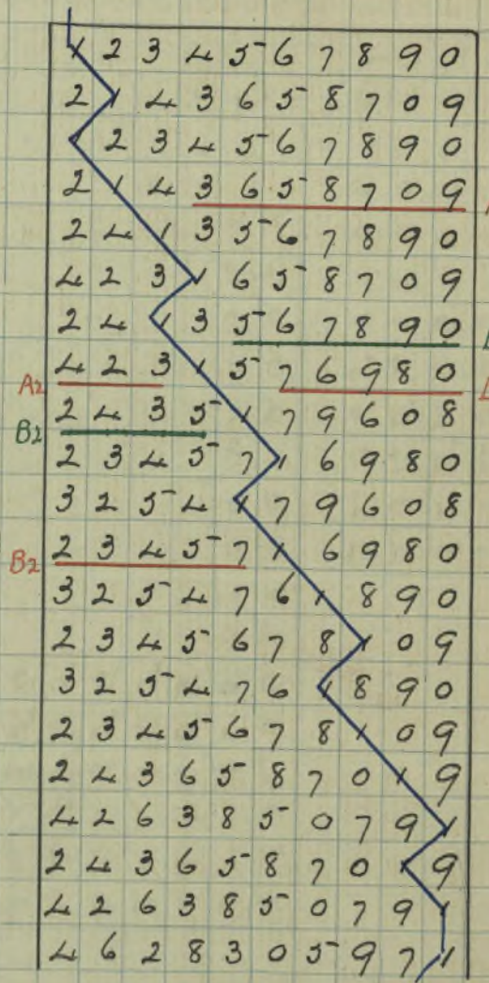
Adjoint.

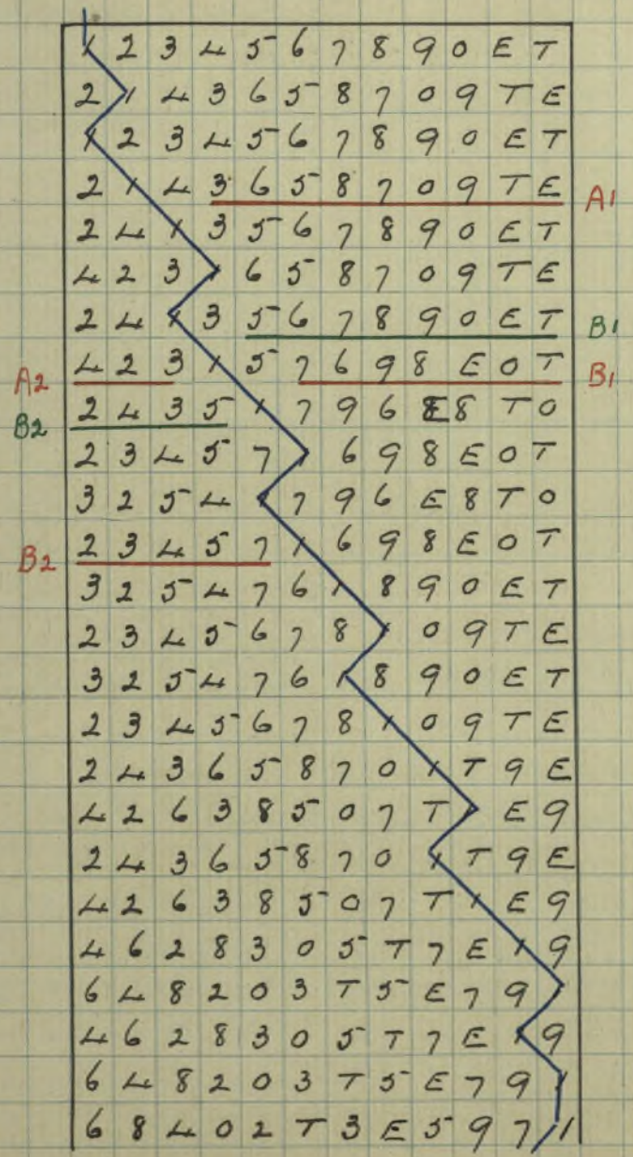
Extension C.

A	B	A	B	C	C	D	D	E	F
7		11						15	

356.







Extension D.

A	B
	7

A	B
	9

A	B
	11

A	B
	13

A	B
	15

Add mt.

The other three Exclensions of the Constructional Shunts are:-

E $\frac{A\,B\,B}{7}$ $\frac{B\,C\,C}{11}$ $\frac{C\,D\,D}{15}$ $\frac{D\,E\,E}{19}$ $\frac{E\,F\,F}{23}$ →

F $\frac{A\,B\,B}{7}$ $\frac{A\,C\,D}{11}$ $\frac{A\,D\,F}{15}$ $\frac{A\,E\,H}{19}$ $\frac{A\,F\,K}{23}$ →

G $\frac{A\,B\,B}{7}$ $\frac{B\,C\,C}{9}$ $\frac{C\,D\,D}{11}$ $\frac{D\,E\,E}{13}$ $\frac{E\,F\,F}{15}$ →

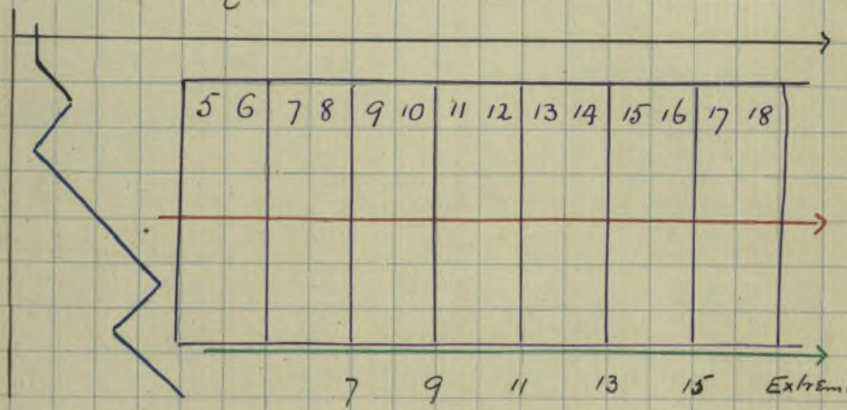
Each Lead of Bristol Surprise Major contains four similar, but independent, additional Shunts.

The Additional Shunt consists of a Dodging Movement on four bells; three steps of Forward Hunting followed by three steps of Backward Hunting which is substituted for the three dodges produced by the Principle and the Constructional Shunts -

6 5 8 7		6 5 8 7
6 8 5 7		5 6 7 8
8 6 7 5	instead of	6 5 8 7
6 8 5 7		5 6 7 8
6 5 8 7		6 5 8 7
5 6 7 8		5 6 7 8.

As we have seen, (page 352) the Additional Shunt by itself can be extended in several ways. Actually its capacity for expansion is restricted by the room allowed by the extension of the Principle and the Constructional Shunts.

Extensions of Constructional Shunts A+B.



The expansion of the Constructional Shunts and the Principle increases the room available for the Additional Shunt, horizontally in regular progression. Vertically the space remains constant.

Therefore the number of steps of Forward and Backward hunting will remain constant on all numbers.

That leaves three ways in which the

Additional Shunts can expand.

1. It may remain Constant in size and position on all numbers;

2. It may remain Constant in size but its position may be altered in regular progression;

3 It may increase in size in regular progression.

That gives us the following Extensions. –

(a) $\frac{5-8}{7}$ $\frac{5-8}{9}$ $\frac{5-8}{11}$ $\frac{5-8}{13}$ $\frac{5-8}{15}$ $\frac{5-8}{17}$ →

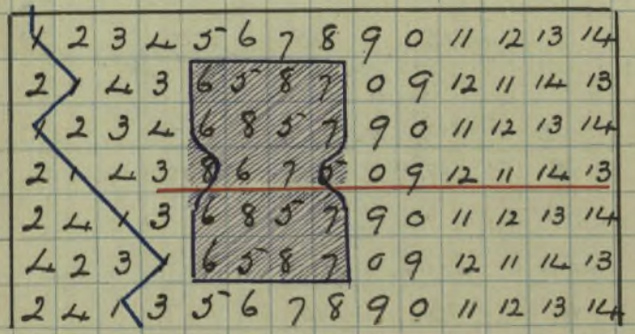
(b) $\frac{5-8}{7}$ $\frac{7-10}{9}$ $\frac{9-12}{11}$ $\frac{11-14}{13}$ $\frac{13-16}{15}$ $\frac{15-18}{17.}$ →

(c) $\frac{5-8}{7}$ $\frac{7-10}{11}$ $\frac{9-12}{15}$ $\frac{11-14}{19}$ $\frac{13-16}{23}$ $\frac{15-18}{27.}$ →

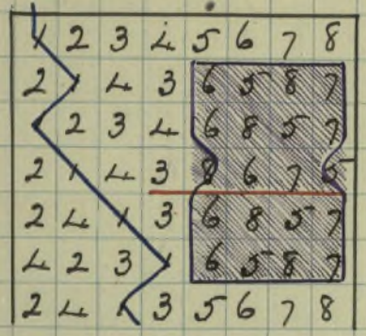
(d) $\frac{5-8}{7}$ $\frac{5-10}{9}$ $\frac{5-12}{11}$ $\frac{5-14}{13}$ $\frac{5-16}{15}$ $\frac{5-18}{17.}$ →

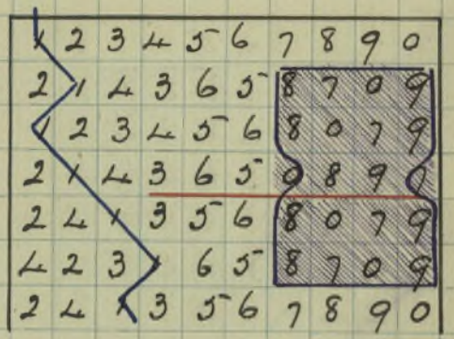
EXTENSIONS OF CONSTRUCTIONAL SHUNTS A and B

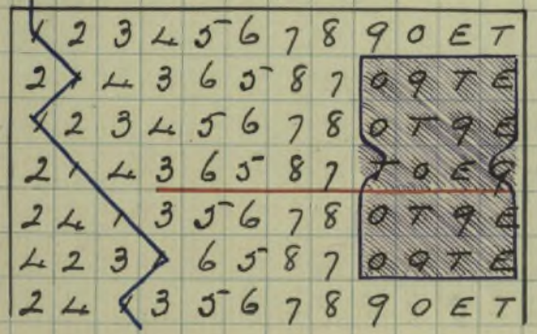
EXTENSION OF ADDITIONAL SHUNT (a)

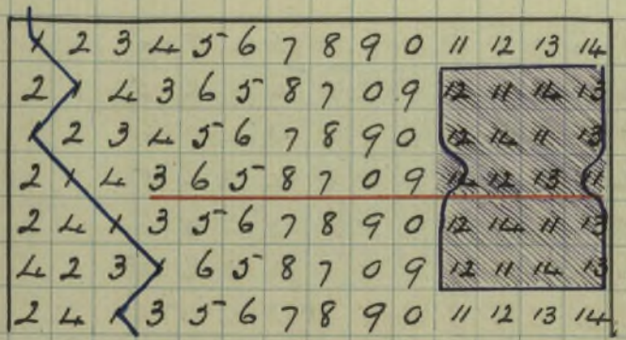


EXTENSION OF ADDITIONAL SHUNT (b)

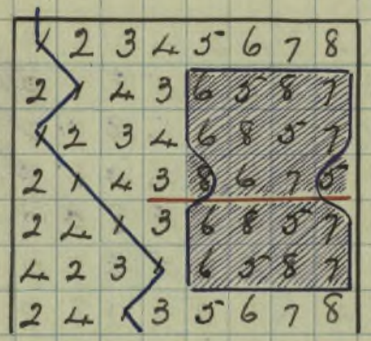


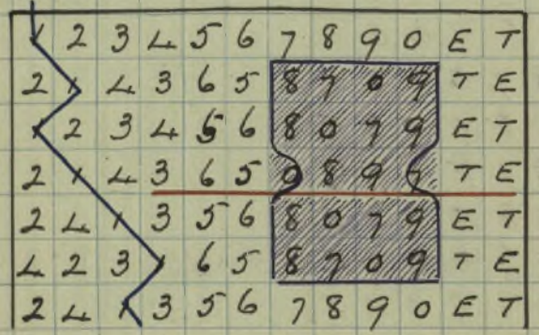


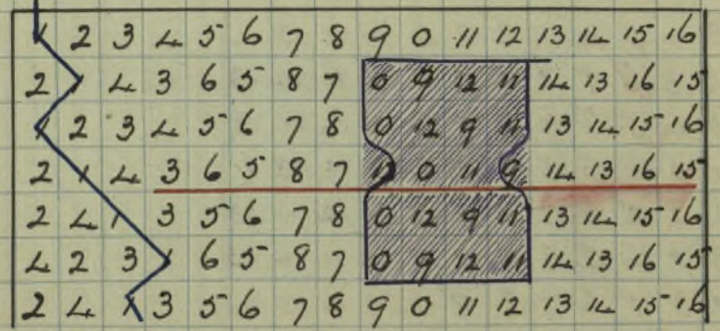




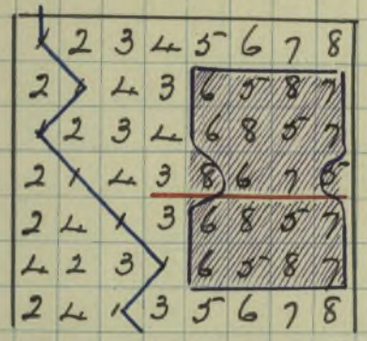
EXTENSION OF ADDITIONAL SHUNT (c)

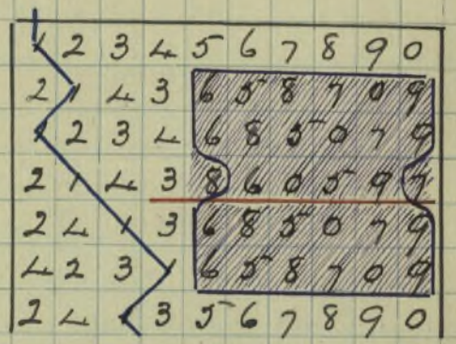


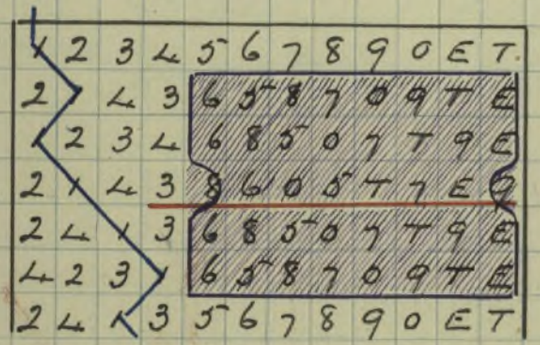


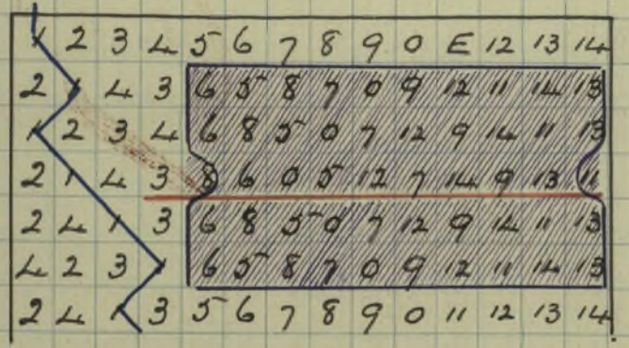


EXTENSION OF ADDITIONAL SHUNT (d)









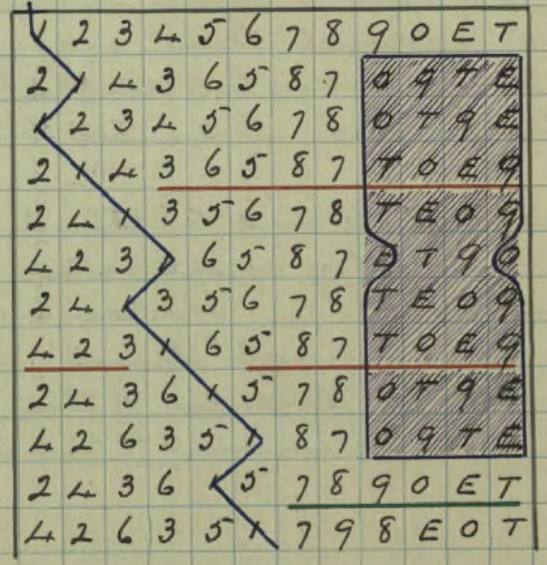
The Extension of the Constructional Shunts No C page 356. gives increased room for the Additional Shunts, not only horizontally but also vertically. Therefore all the Extensions of the Additional Shunts given on pp. 360 - 362. will apply; and in addition the following

1. The Additional Shunt may expand vertically, but remain constant horizontally;
2. The Additional Shunt may expand both vertically and horizontally;
3. The Additional Shunt may remain constant, in size both vertically and horizontally, but increase in number;
4. The Addional Shunt may remain constant vertically, but expand horizontally and also increase in number;

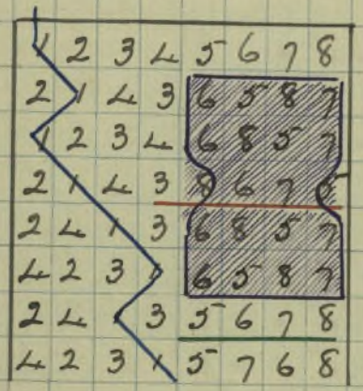
These will all be fine Extensions, but they are not all of equal value. Those given on pp. 360 - 362. applied to Extension C of the Constructional Shunts will not remove all the falseness of that Extension. Neither will Extensions 1. and 2.

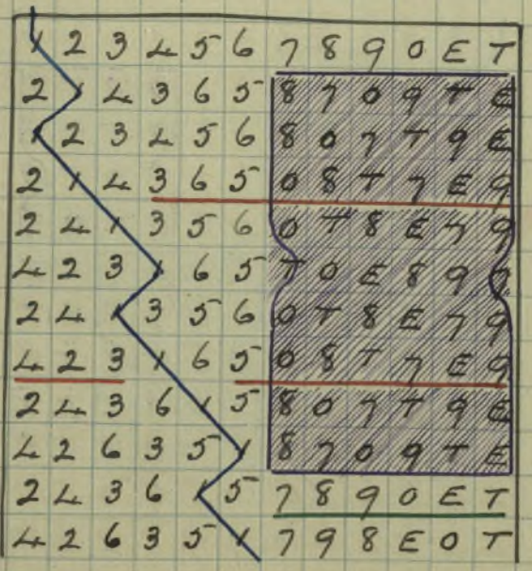
EXTENSION OF CONSTRUCTIONAL SHUNTS C

The Additional Shunt remains constant horizontally but Expands vertically

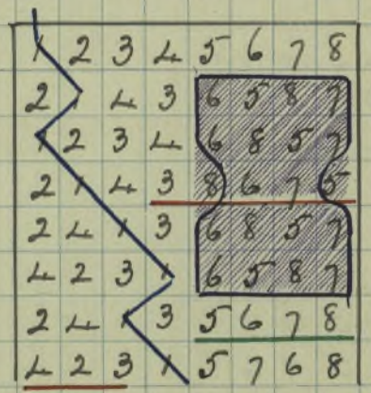


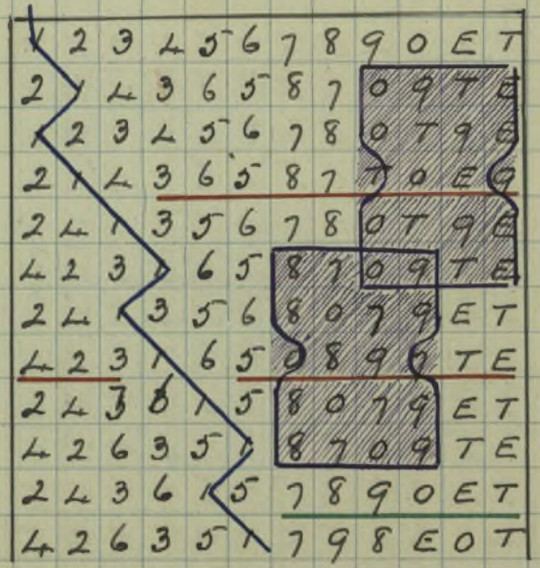
The Additional Shunt expands both horizontally and vertically



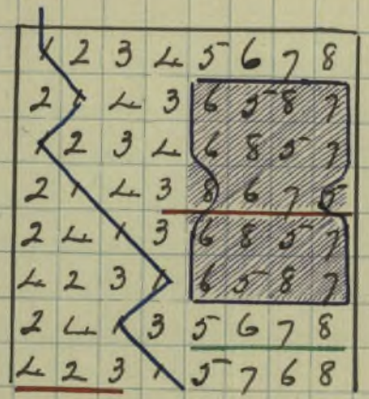


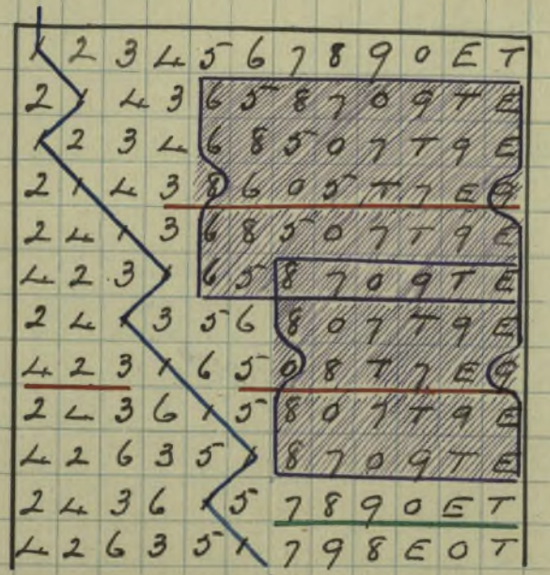
The Additional Shunt remains constant in size but Expands in number.





The Additional Shunt remains constant Vertically but Expands horizontally; and in number.





The other three Additional Shunts Extend in exactly similar fashion to the examples given (p.p.

Extensions of Constructional Shunts D and G.-
The Additional Shunts in these expand as Extensions A and B (p.p 360-362), except that in D, the Shunts below the Treble must remain Constant on all numbers; and in G the Shunt above the Treble must remain Constant on all numbers.

Extension of Constructional Shunts E.-
The Additional Shunts in this expand as in Extensions A and B.

Extension of Constructional Shunts F.-
The Additional Shunts cannot be applied to this.

The Extensions of Bristol Surprise Major are excellent examples of how an Add: Shunt which consists of a Dodging Movement can expand. They illustrate also the fact that an expanded Add: Shunt will not always perform the same duty in removing repetition of

Rows that its original does.

These Excisions also show the correct way in which the different Excisions of any Method should be worked out.

First, take the Principle and apply the Laws of Excision to it. See if there is more than one valid Excision.

Second, to each Excision of the Principle apply every possible valid Excision of the Constructional Shunts.

Thirdly, to each Excision of the Constructional Shunts apply every possible valid Excision of the Additional Shunts, if there be any.

The result will be the total number of valid Excisions of the Method.
Then then arises the further question of the different values of these Excisions.
I will deal with that presently.

In their natural form Slow Work Shunts are of no use in practical methods. Additional Shunts must be made to prevent the bells lying for more than two Consecutive blows in any one position. Various Additional Shunts and Combinations of Additional Shunts will do this; but no Shunt or Combination of Shunts (with Exclusions) will apply to every Slow Work Shunt. The two most nearly universal are as follows:-

1. When there is an even number of Slow Work Bells they should dodge continually. This applies to every Principle.

2. On the Treble Bob Principle, when there is an odd number of Slow Work Bells, the Slow Work Bell next the other Bells should Consecutively make Places in the interior of the Sections, the rest of the Slow Work Bells dodging continually. *

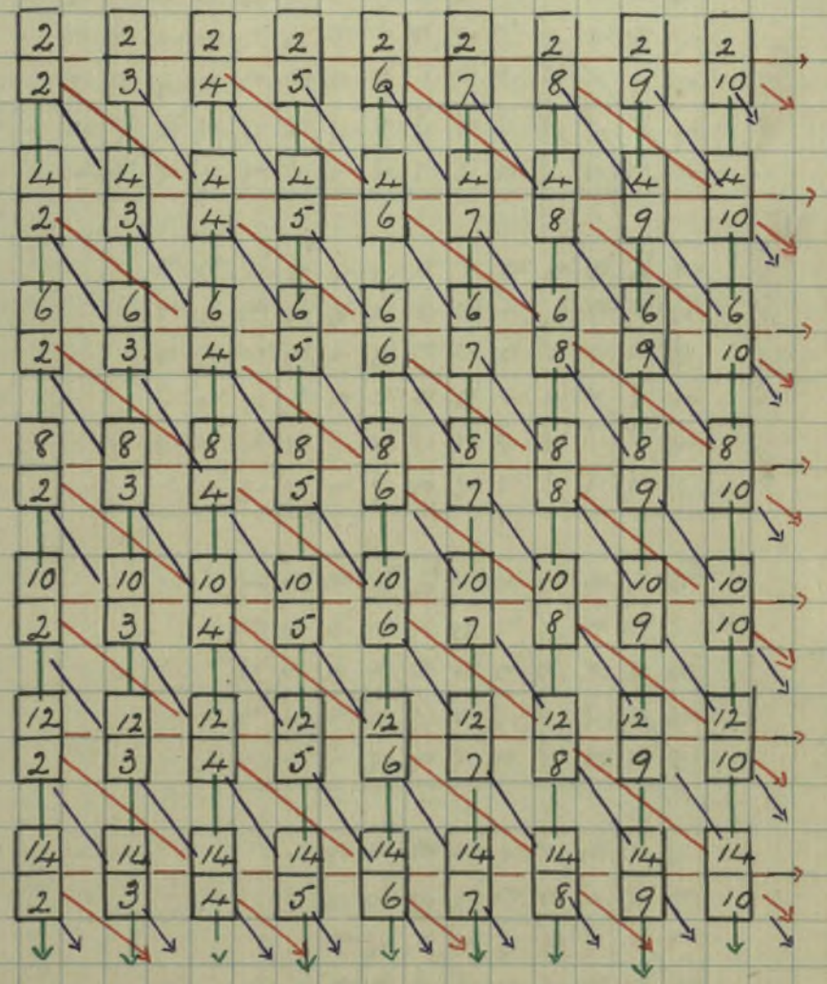
The following are the Exclusions of these Shunts;-

* See pp. 210. 211.

In the Table the top figure in each Symbol represents the number of Slow Work Bells
The bottom figure represents the number of "Other" Bells including the Hunt of the Method.

In addition to the Extensions marked, if any two Symbols be connected by a straight line and that line prolonged to infinity the series of Symbols it passes through will represent a valid Extension.

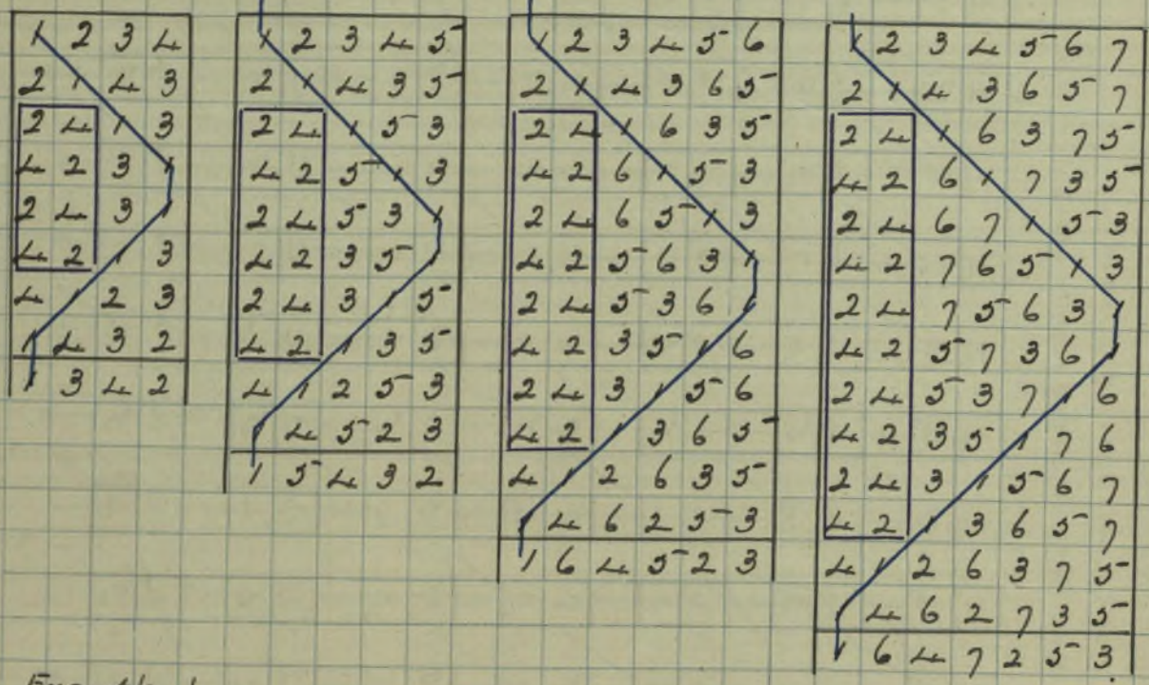
On All Principles
Slow Work Constructional Shunt.
Slow Work Bells to dodge continuously.



ad int.

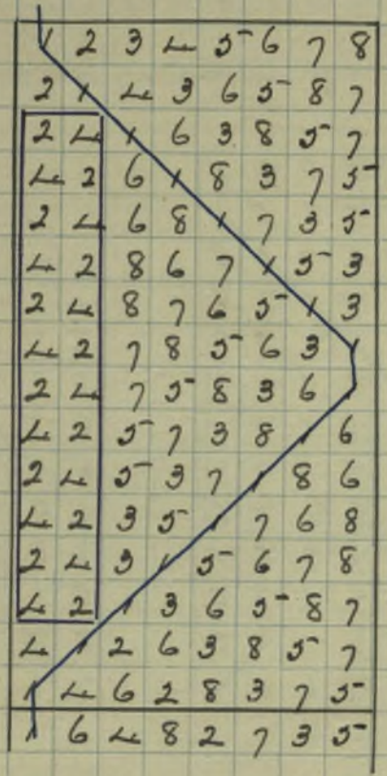
Examples of EXTENSIONS from Formula page 369.

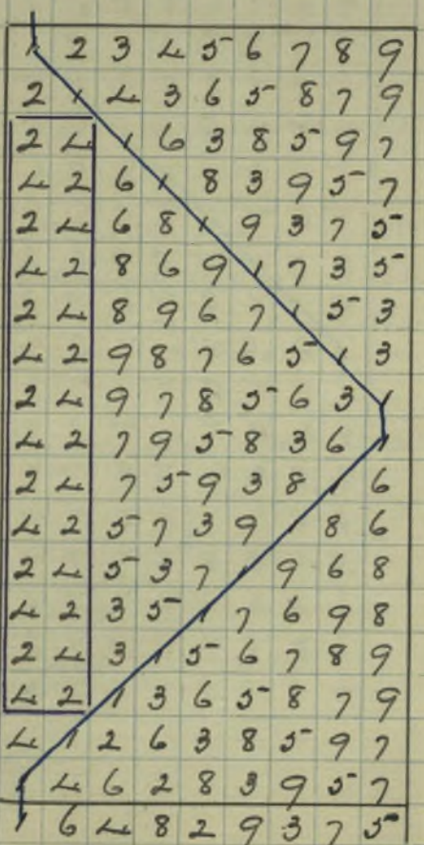
COLLEGE MINOR.



Example 1.

$$\frac{2}{2} \quad \frac{2}{3} \quad \frac{2}{4} \quad \frac{2}{5^-} \quad \frac{2}{6} \quad \frac{2}{7} \quad \frac{2}{8} \quad \frac{2}{9} \quad \frac{2}{10} \longrightarrow \text{ad inf.}$$





\	2	3	4
2	\	4	3
2	4	\	3
4	2	3	\
2	4	3	\
4	2	\	3
4	\	2	3
\	4	3	2
V	3	4	2

\	2	3	4	5	6
2	\	4	3	6	5
2	4	\	6	3	5
4	2	6	\	5	3
2	4	6	5	\	3
6	4	5	2	3	\
4	6	2	5	3	\
6	4	5	2	\	3
6	5	4	\	2	3
5	6	\	4	3	2
5	\	6	3	4	2
\	5	3	6	2	4
V	3	5	2	6	4

\	2	3	4	5	6	7	8
2	\	4	3	6	5	8	7
2	4	\	6	3	8	5	7
4	2	6	\	8	3	7	5
4	6	2	8	\	7	3	5
6	4	8	2	7	\	5	3
6	8	4	7	2	5	\	3
8	6	7	4	5	2	3	\
6	8	4	7	2	5	3	\
8	6	7	4	5	2	\	3
8	7	6	5	4	\	2	3
7	8	5	6	\	4	3	2
7	5	8	\	6	3	4	2
5	7	\	8	3	6	2	4
5	\	7	3	8	2	6	4
\	5	3	7	2	8	4	6
V	3	5	2	7	4	8	6

Example of Extension 2.

$$\frac{2}{2} - \frac{4}{2} - \frac{6}{2} - \frac{8}{2} - \frac{10}{2} \rightarrow \text{ad inf.}$$

\	2	3	4	5	6	7	8	9	0
2	\	4	3	6	5	8	7	0	9
2	4	\	6	3	8	5	0	7	9
4	2	6	\	8	3	0	5	9	7
4	6	2	8	\	0	3	9	5	7
6	4	8	2	0	\	9	3	7	5
6	8	4	0	2	9	\	7	3	5
8	6	0	4	9	2	7	\	5	3
8	0	6	9	4	7	2	5	\	3
0	8	9	6	7	4	5	2	3	\
8	0	6	9	4	7	2	5	3	\
0	8	9	6	7	4	5	2	\	3
0	9	8	7	6	5	4	\	2	3
9	0	7	8	5	6	\	4	3	2
9	7	0	5	8	\	6	3	4	2
7	9	5	0	\	8	3	6	2	4
7	5	9	\	0	3	8	2	6	4
5	7	\	9	3	0	2	8	4	6
5	\	7	3	9	2	0	4	8	6
\	5	3	7	2	9	4	0	6	8
V	3	5	2	7	4	9	6	0	8

\	2	3	4	5	6	7	8	9	0	E	T
2	\	4	3	6	5	8	7	0	9	T	E
2	4	\	6	3	8	5	0	7	T	9	E
4	2	6	\	8	3	0	5	T	7	E	9
4	6	2	8	\	0	3	T	5	E	7	9
6	4	8	2	0	\	T	3	E	5	9	7
6	8	4	0	2	T	\	E	3	9	5	7
8	6	0	4	T	2	E	\	9	3	7	5
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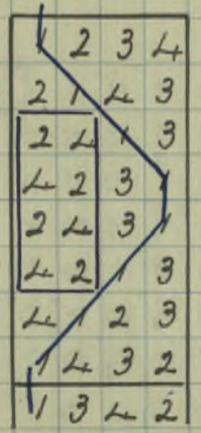
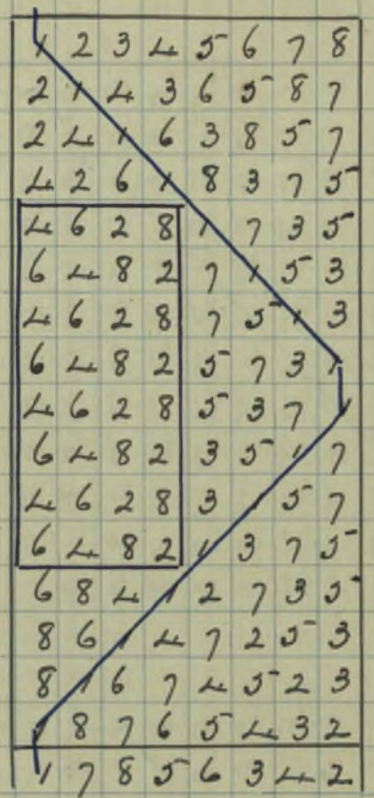
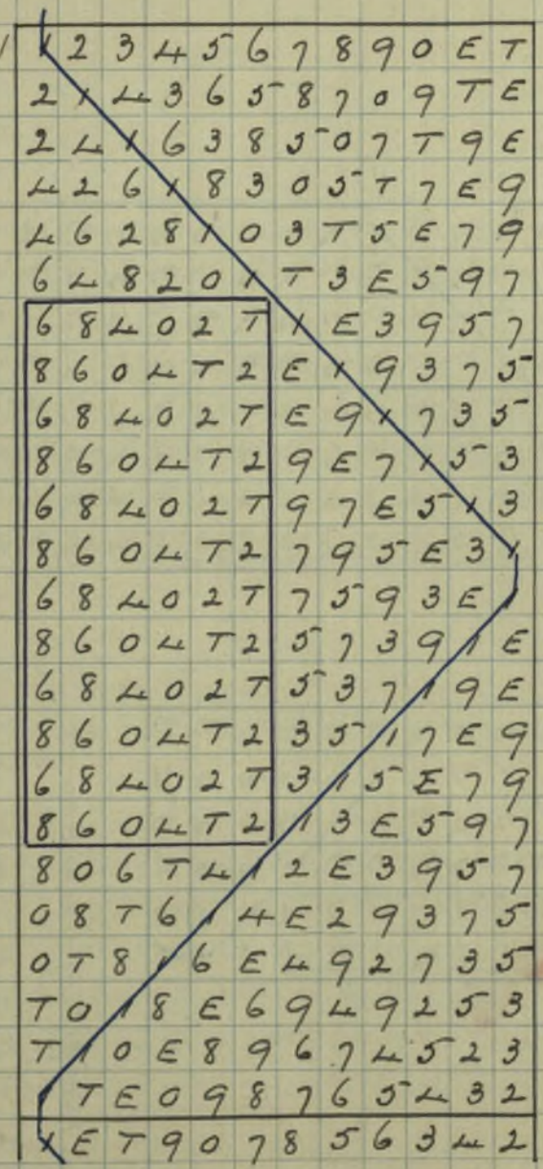
0	8	T	6	E	4	9	2	7	\	5	3
0	T	8	E	6	9	4	7	2	5	\	3
T	0	E	8	9	6	7	4	5	2	3	\
0	T	8	E	6	9	4	7	2	5	3	\
T	0	E	8	9	6	7	4	5	2	\	3
T	E	0	9	8	7	6	5	4	\	2	3
E	T	9	0	7	8	5	6	\	4	3	2
E	9	T	7	0	5	8	\	6	3	4	2
9	E	7	T	5	0	\	8	3	6	2	4
9	7	E	5	T	\	0	3	8	2	6	4
7	9	5	E	\	T	3	0	2	8	4	6
7	5	9	\	E	3	T	2	0	4	8	6

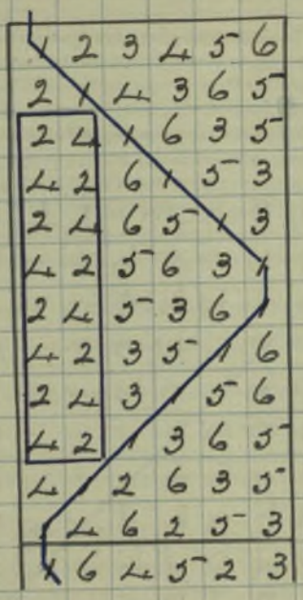


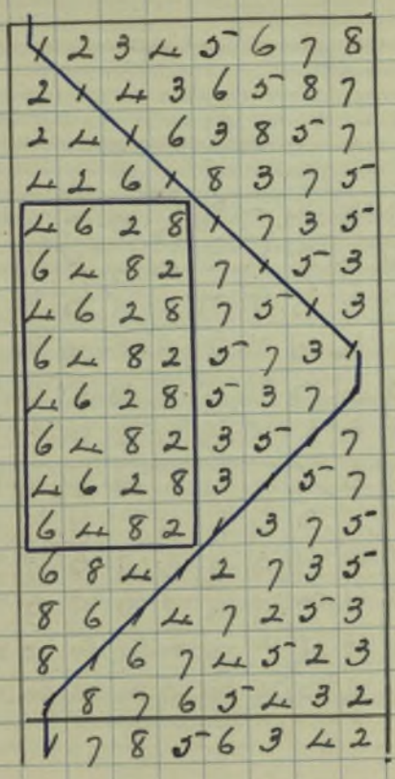




Example of Extension 3.

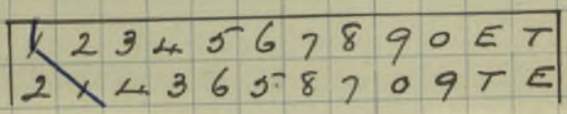
$$\frac{2}{2} - \frac{4}{4} - \frac{6}{6} - \frac{8}{8} - \frac{10}{10} - \frac{12}{12} - \frac{14}{14} - \frac{16}{16} \longrightarrow \text{ad inf.}$$

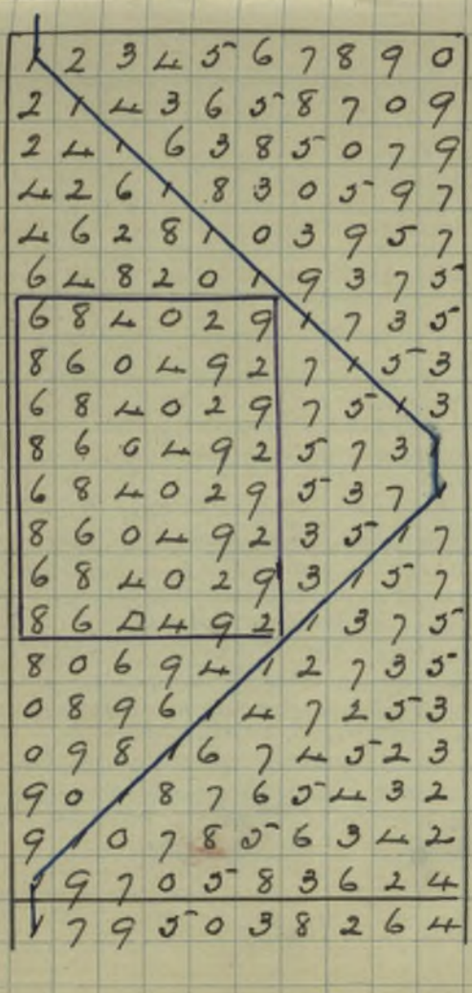


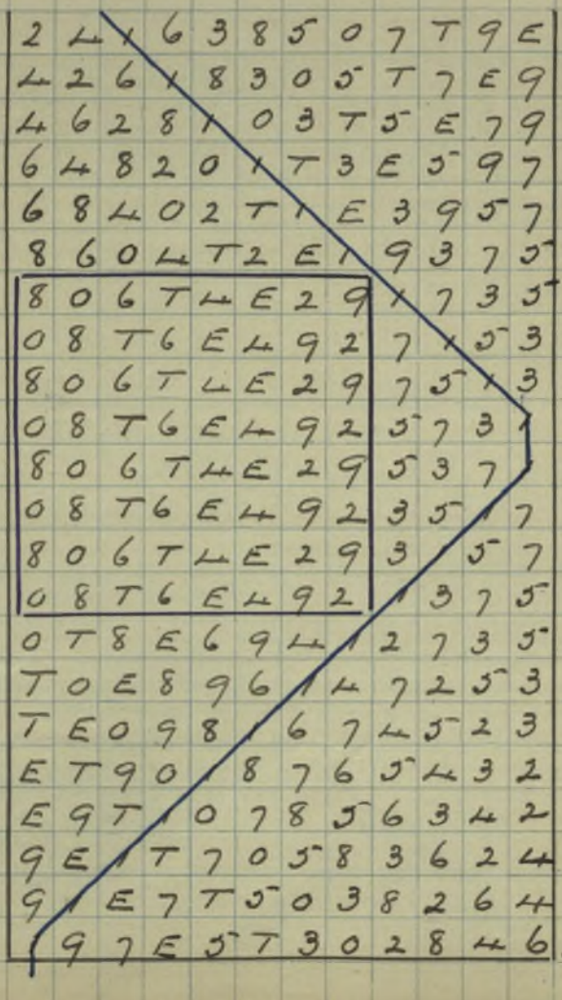


Example of Extension A.

$\frac{2}{4} - \frac{4}{4} - \frac{6}{4} - \frac{8}{4} - \frac{10}{4} \rightarrow$ adjnt.







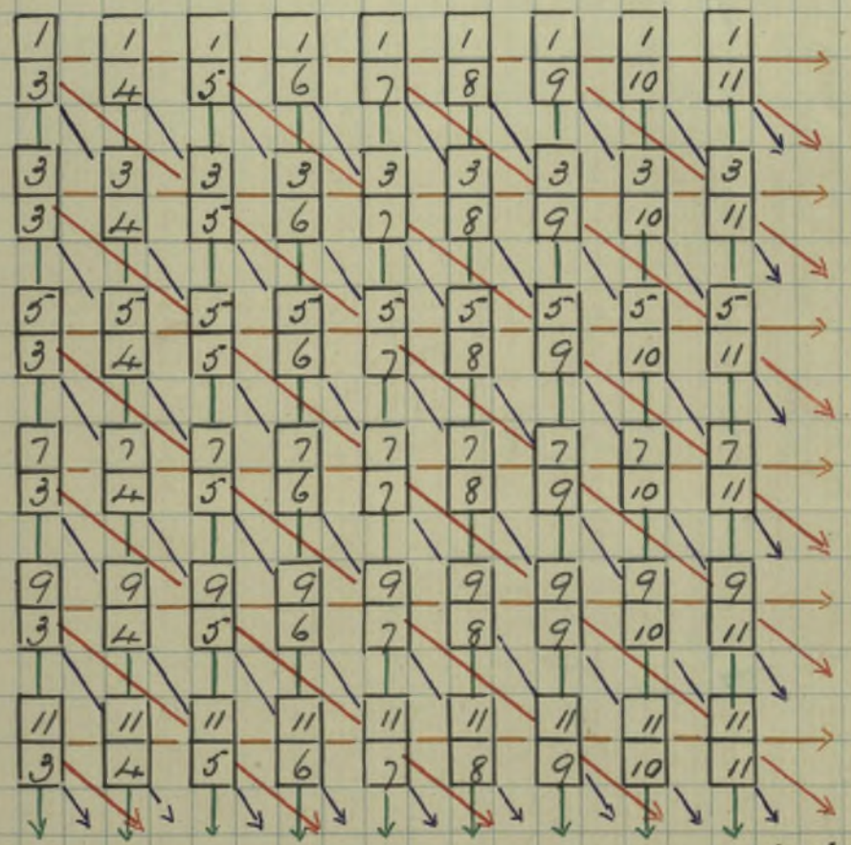
TREBLE BOB PRINCIPLE

SLOW WORK CONSTRUCTIONAL SHUNTS

Nos of Slow Work Bells to be odd.

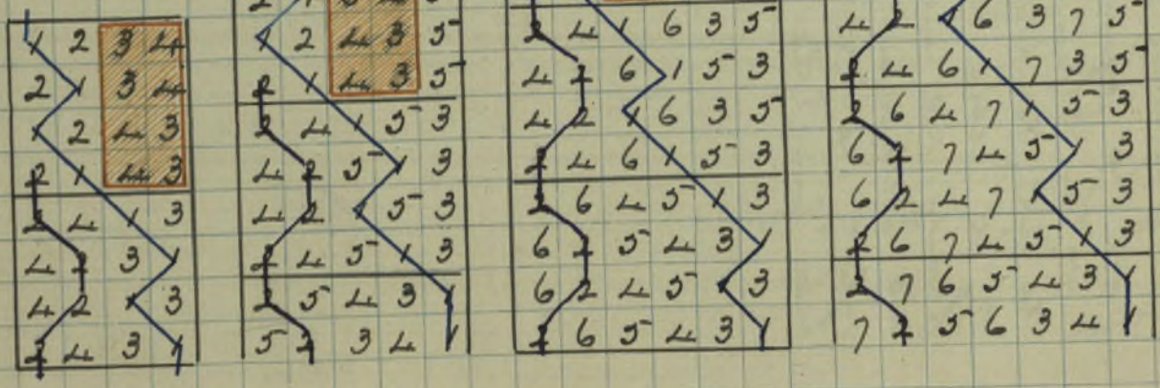
Slow Work Bell nearest to Other Bells to make Place consecutively in interior of Section.

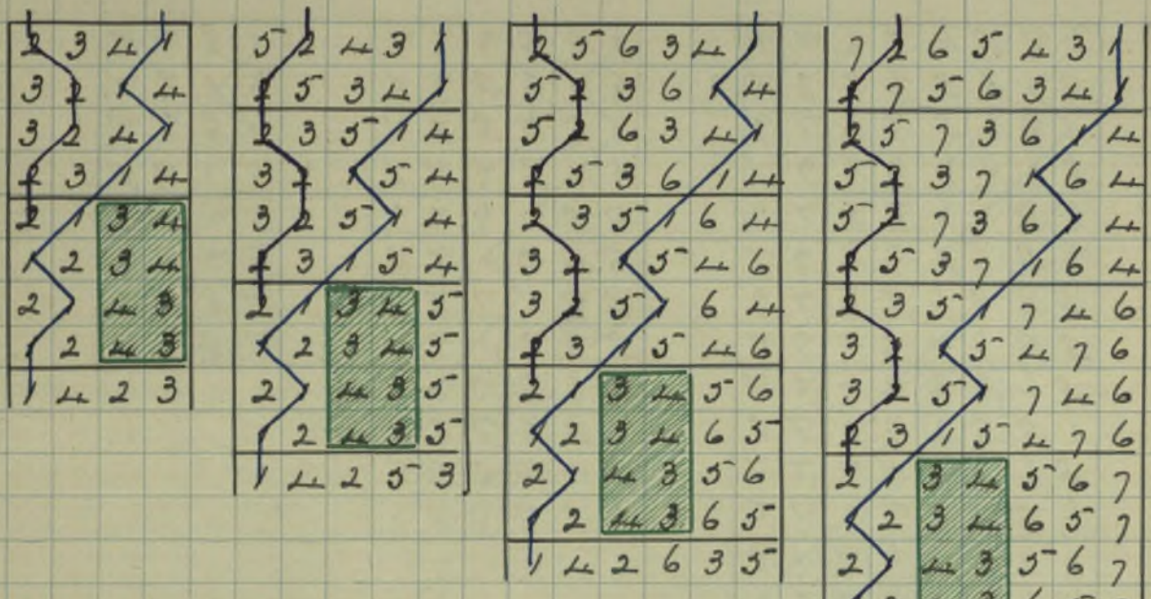
The Rest of the Slow Work Bells to dodge continuously.



Ad. inf.

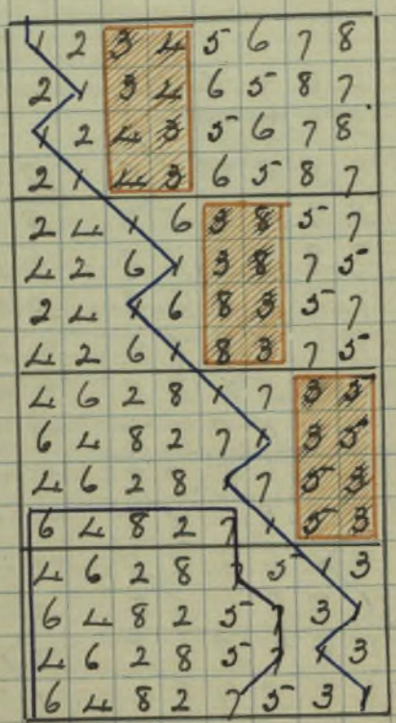
The following are examples of Extension from the formula on page 374.
As the Shunts given in that formula do not completely remove the Falseness of the Treble Bob Principle other Add: Shunts are included. I have given one Extension of these Additional Shunts only The full number possible can be Laid from the formula on p.p. 340. 341.

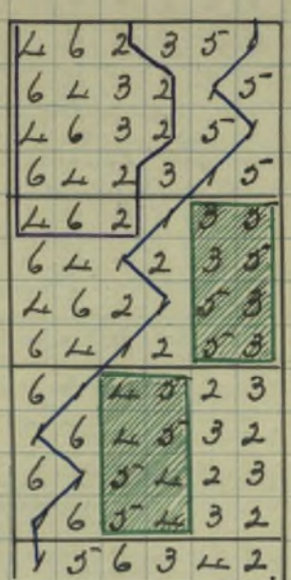


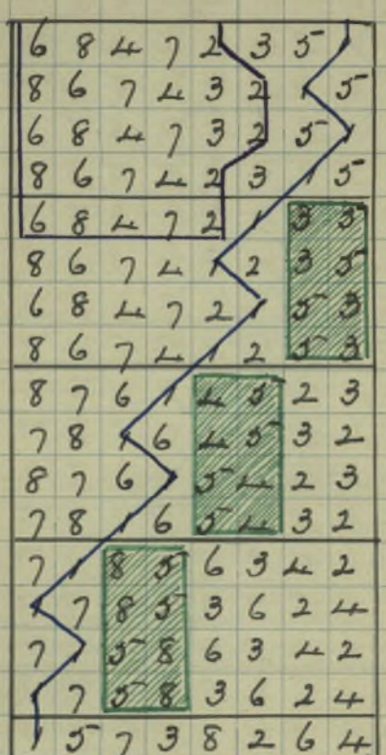


Example of Extension 1.

$$\frac{1}{3} - \frac{1}{4} - \frac{1}{5} - \frac{1}{6} - \frac{1}{7} - \frac{1}{8} - \frac{1}{9} - \frac{1}{10} - \frac{1}{11} \longrightarrow \text{Ad inf.}$$

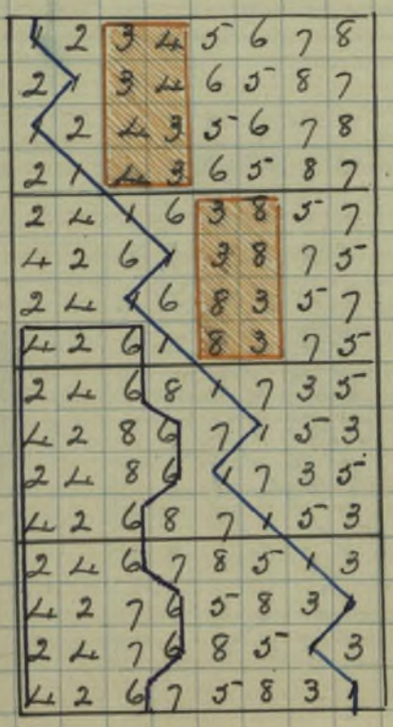


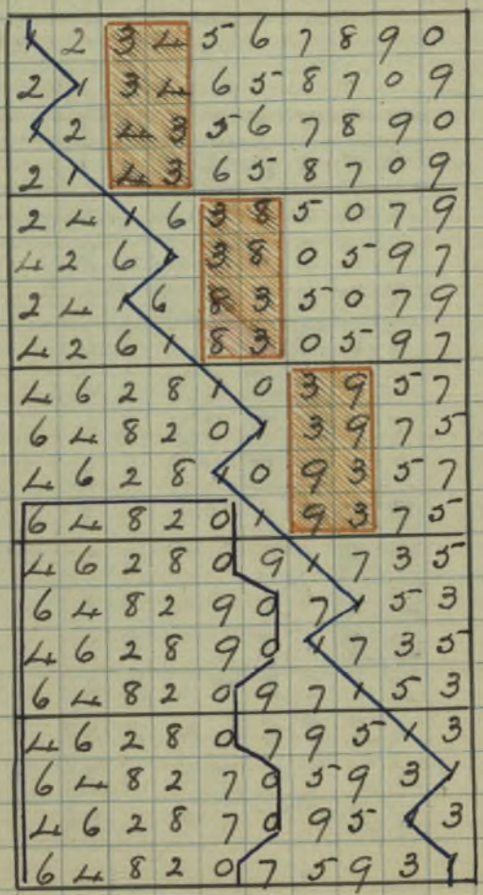


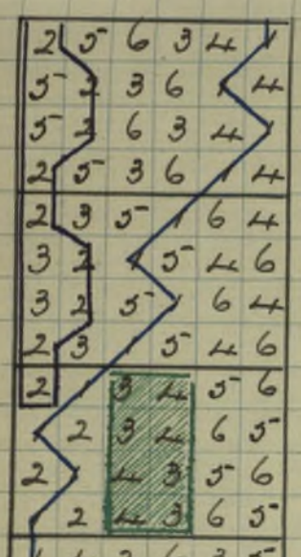


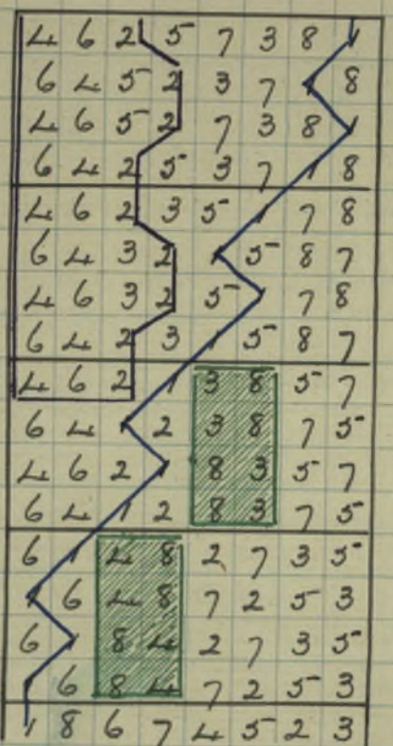
Example of Extension 2.

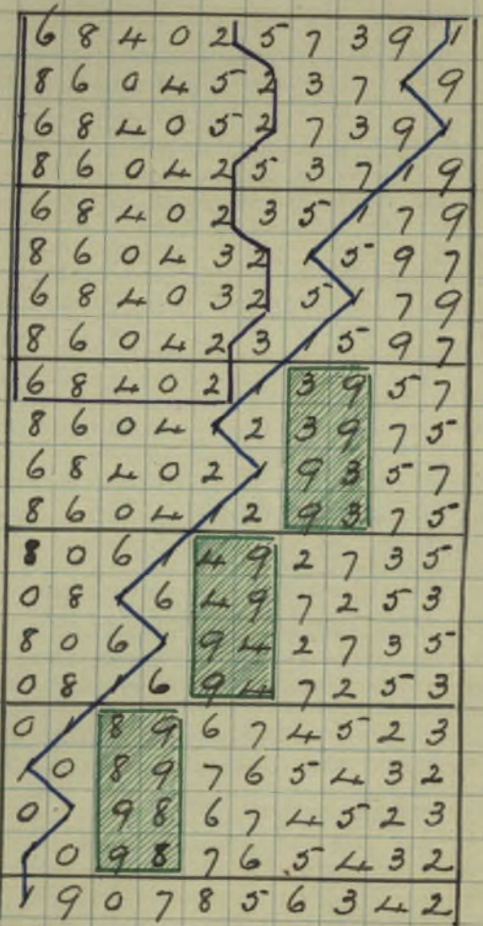
$$\frac{1}{3} - \frac{3}{3} - \frac{5^-}{3} - \frac{7}{3} - \frac{9}{3} - \frac{11}{3} - \frac{13}{3} - \frac{15^-}{3} \longrightarrow \text{Ad inf.}$$









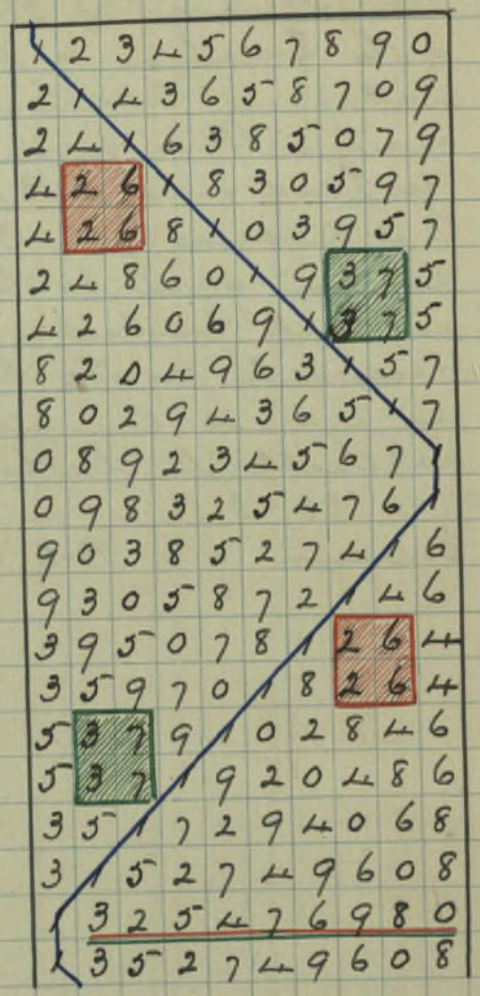


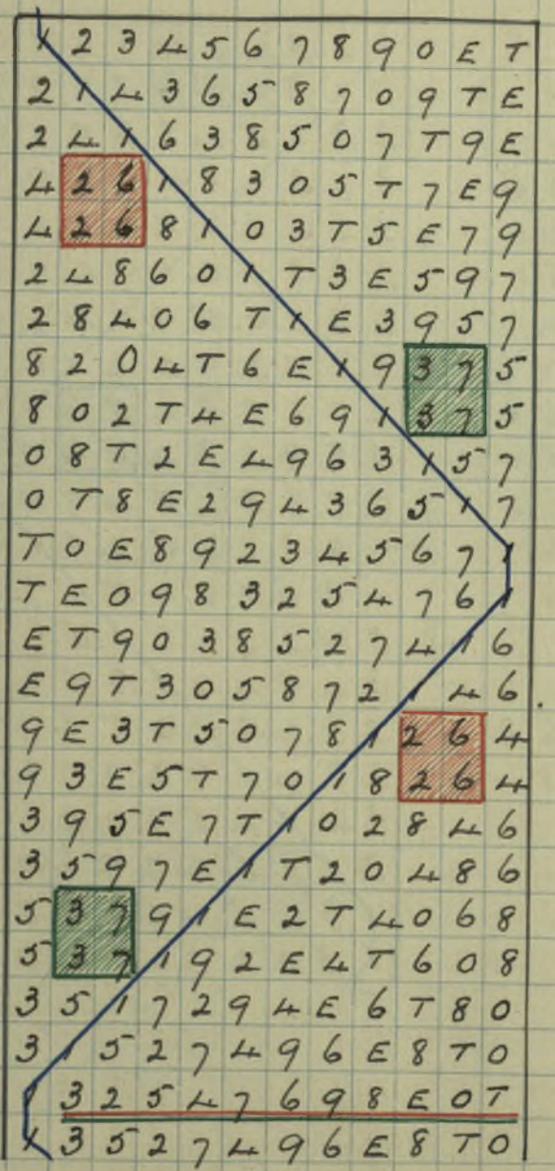
Example of Extension 3.

$$\frac{1}{5} - \frac{3}{5} - \frac{5}{5} - \frac{7}{5} - \frac{9}{5} - \frac{11}{5} - \text{Ad inf.}$$

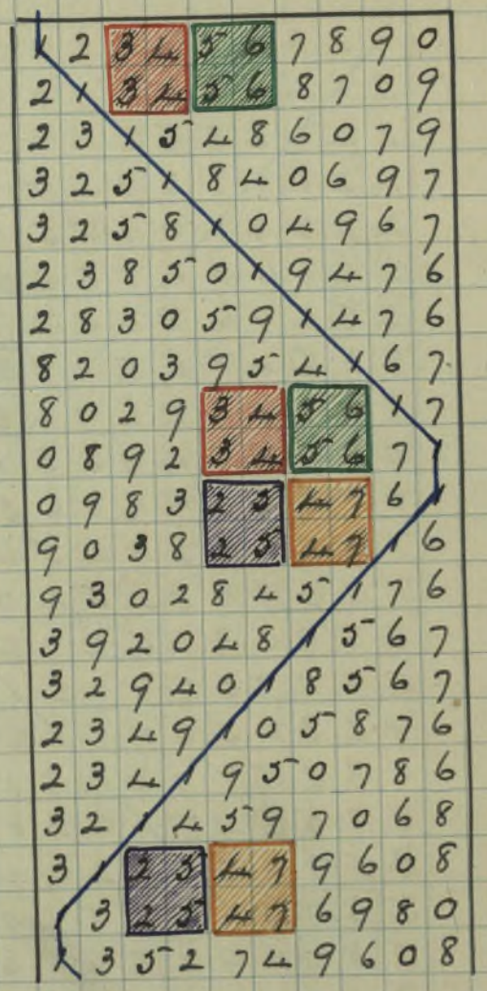
The following (pp. 380 - 389) are examples of the Extension of Methods which have overlapping Additional Stunts. The Lead marked A is produced from the Principle. The Lead marked B is produced from A; C is produced from B and so on. These are not given as the only possible extension in each particular instance; or even, necessarily, as the best extension. But as typical examples illustrating laws applicable to Methods in general. On pp. 383 - 385 is an illustration of the Extension of a B-S Court Stunt (p. 218).

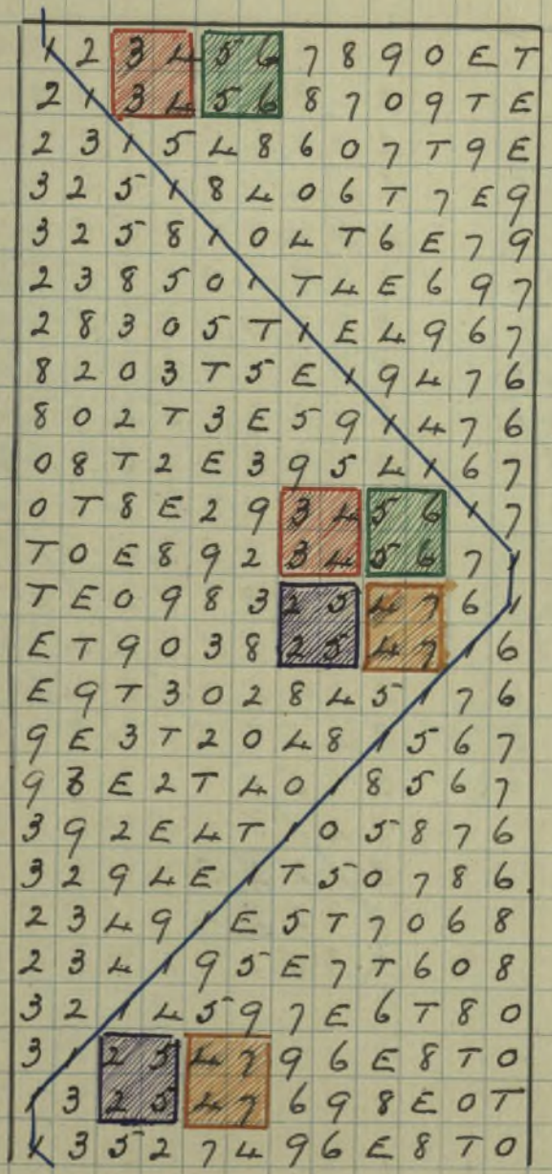
A.

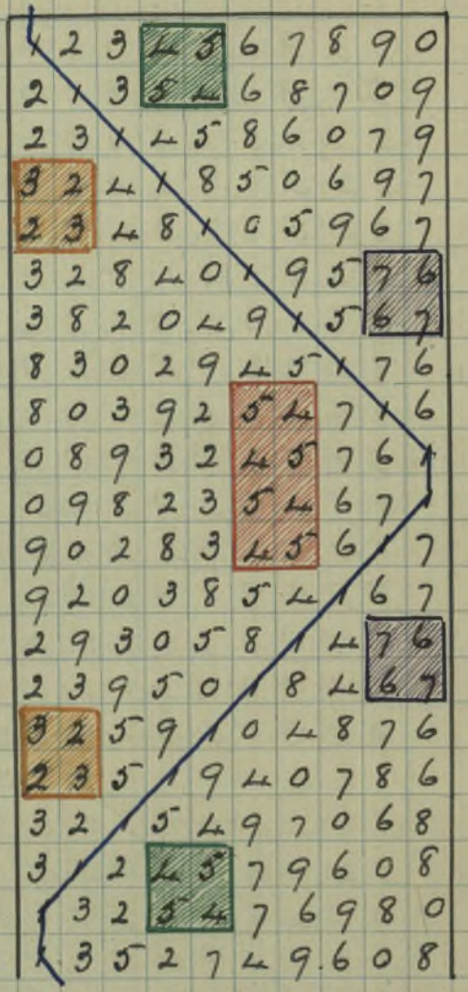


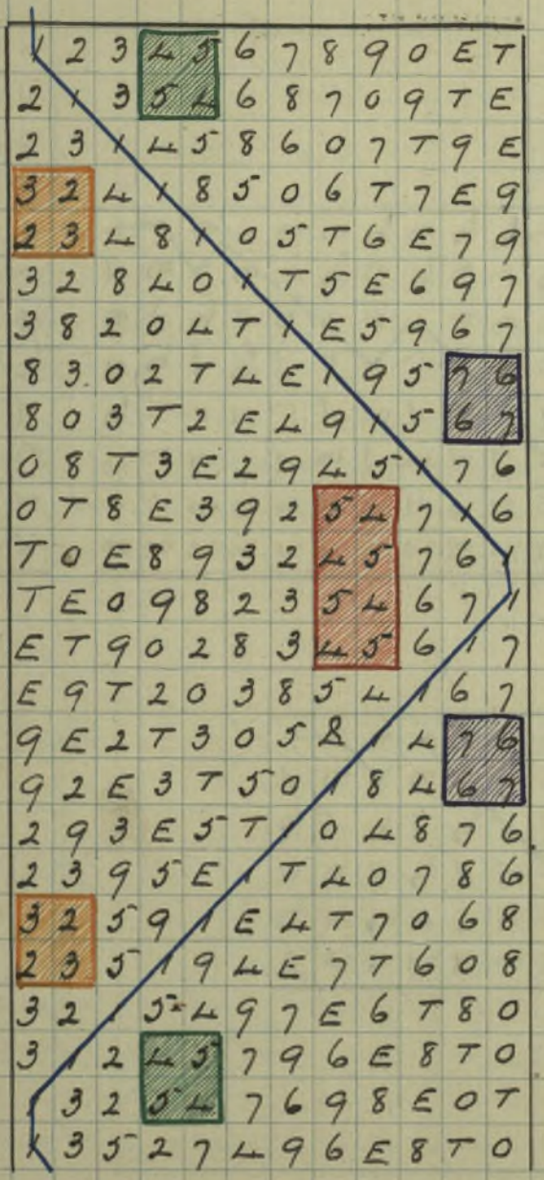


B.

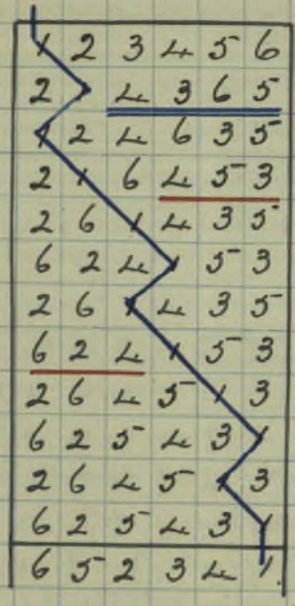


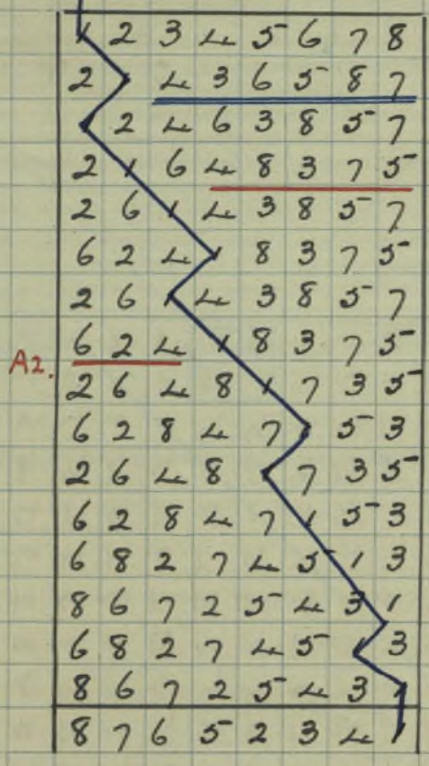


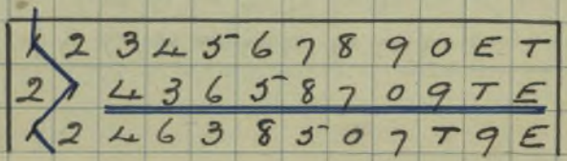




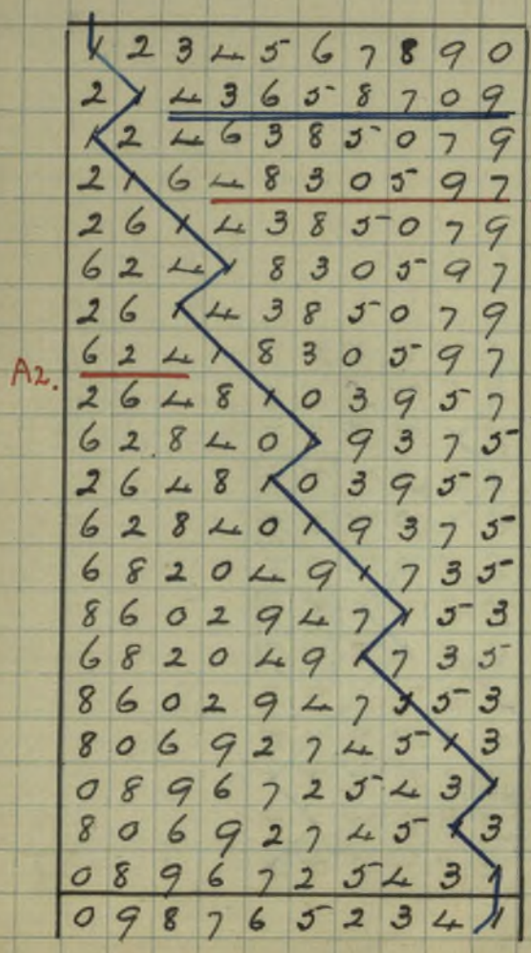
A

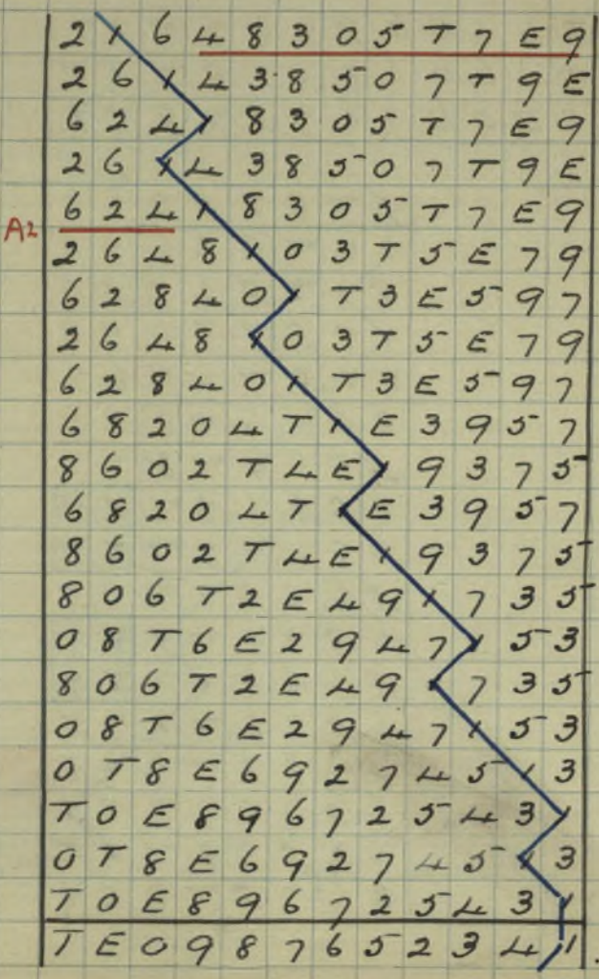




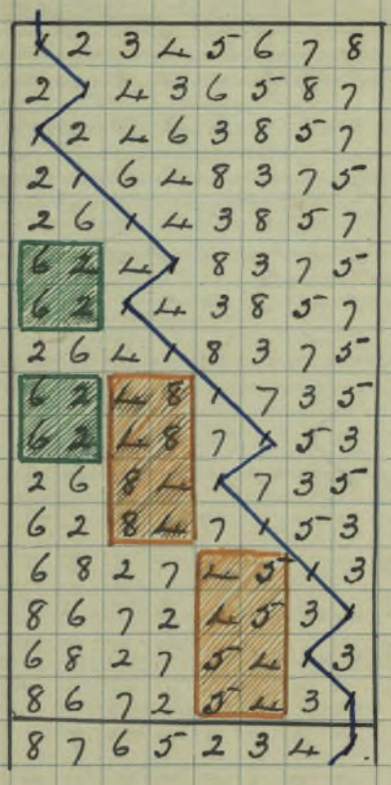


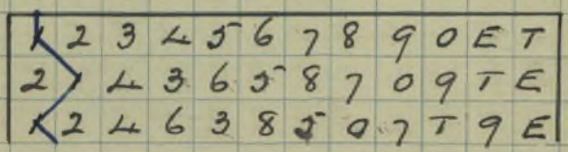
* Incomplete See p. 218.

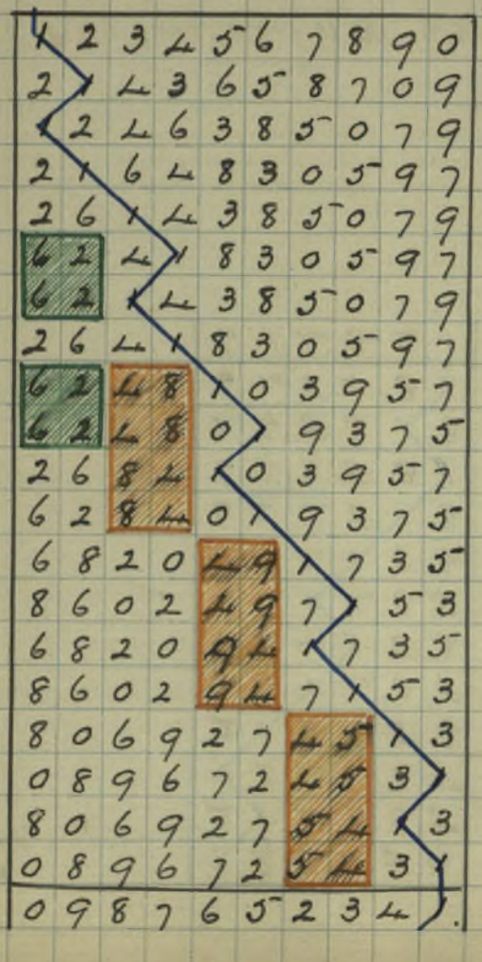


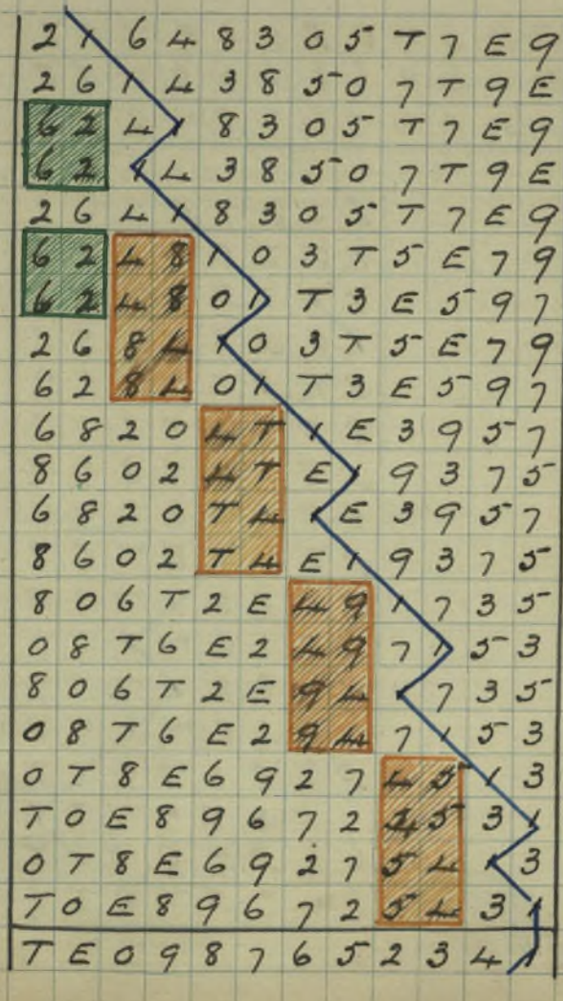


B.



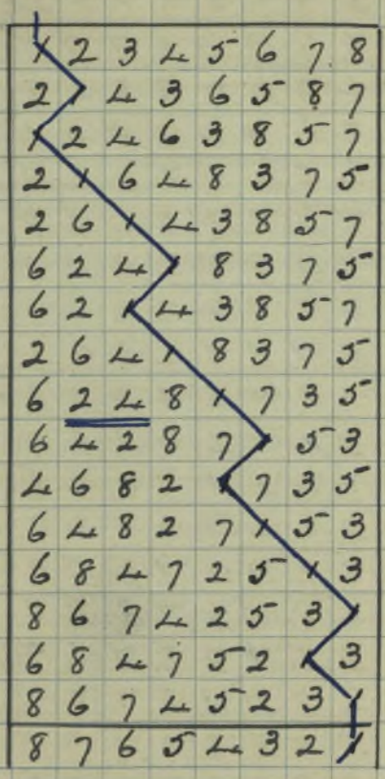




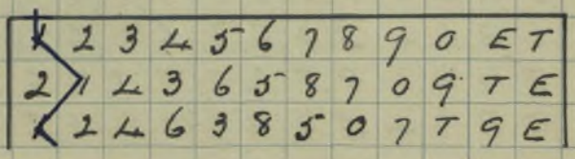


C.

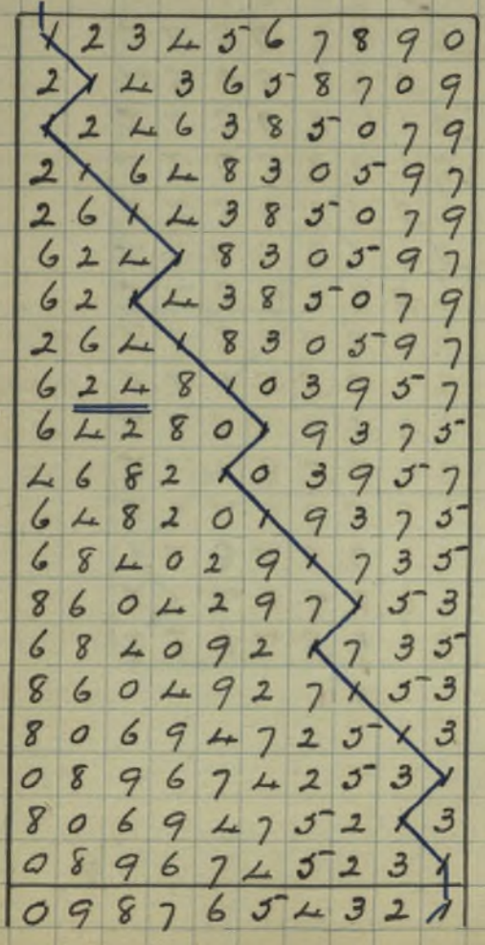
*A2



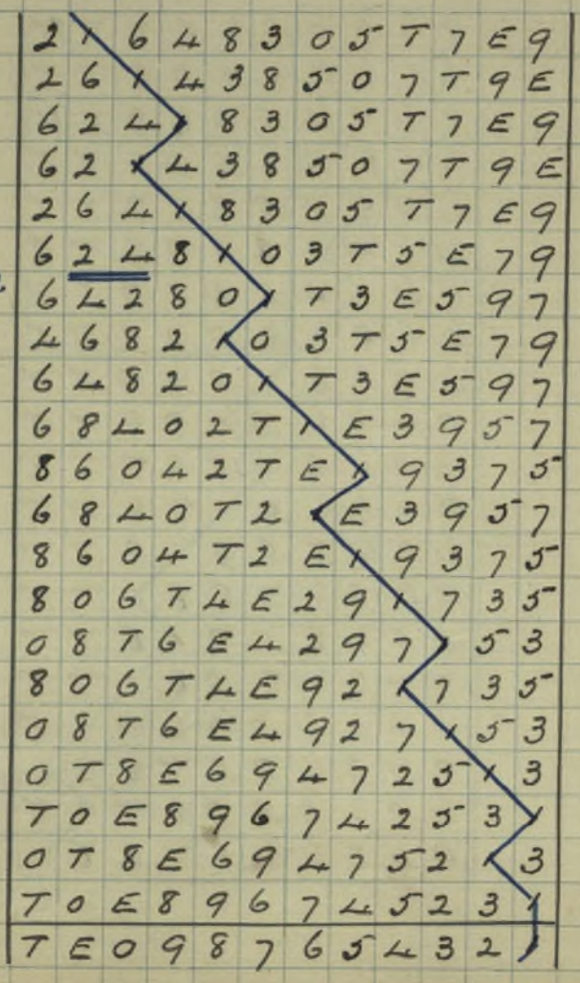
*A2



* A2 = Completion of A1. p 383

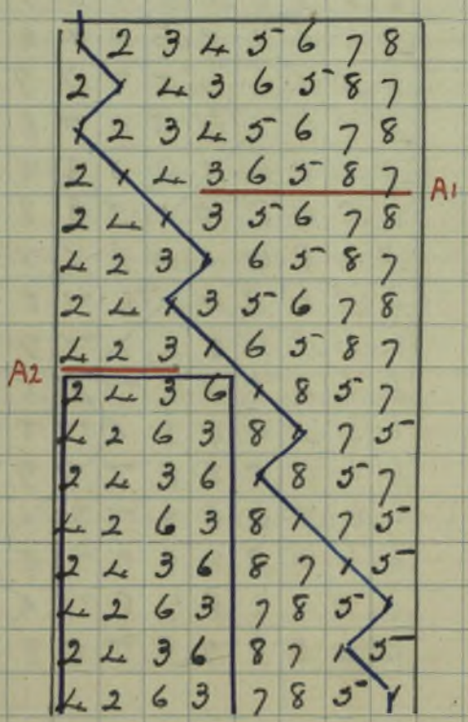


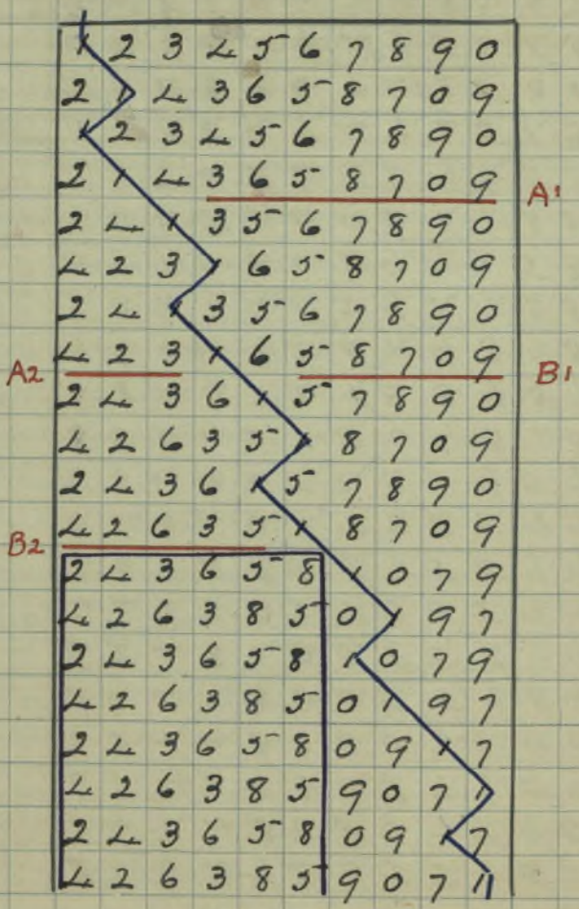
*A2

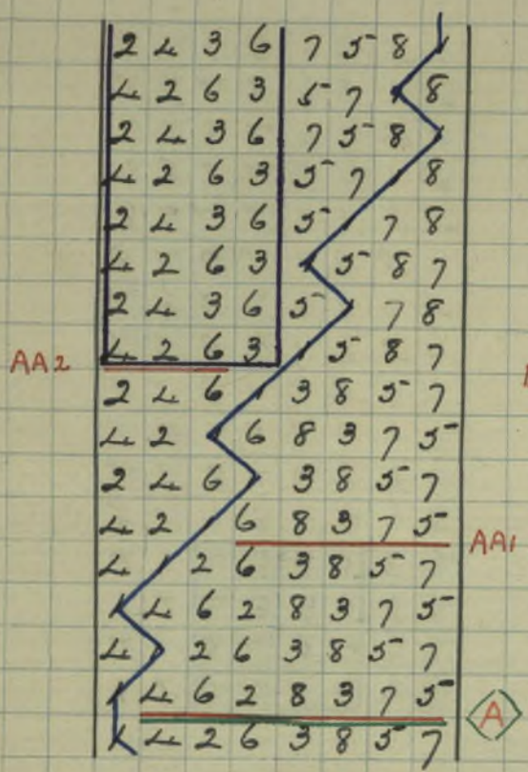


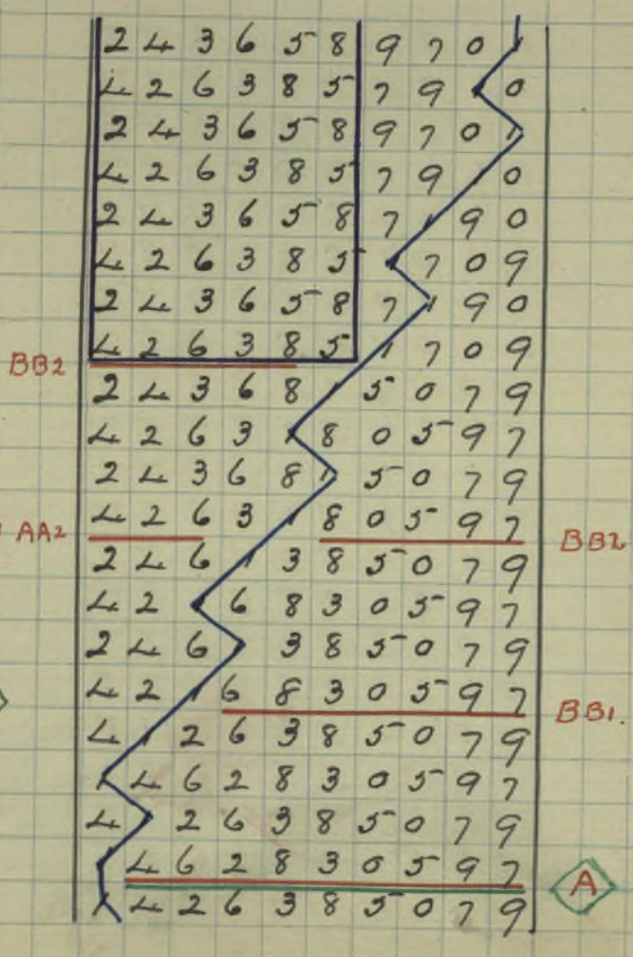
*A2

A.



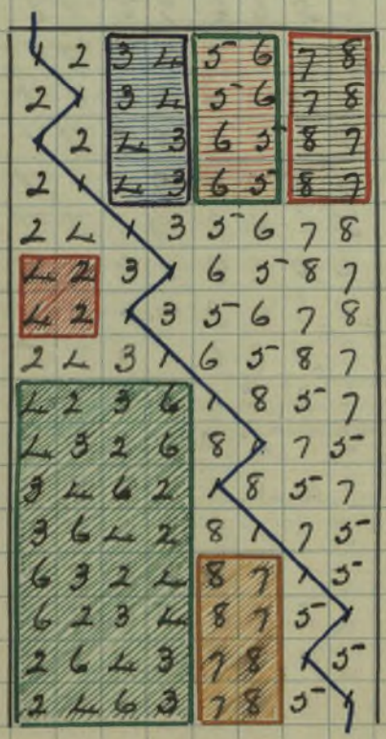


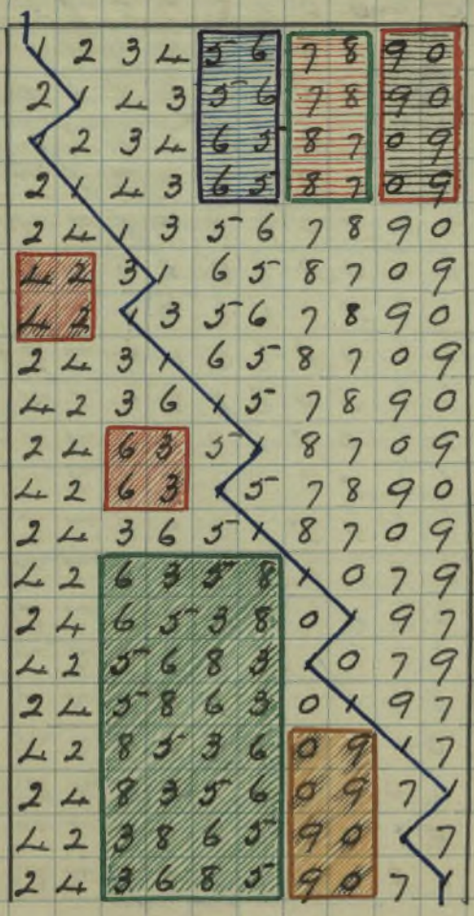


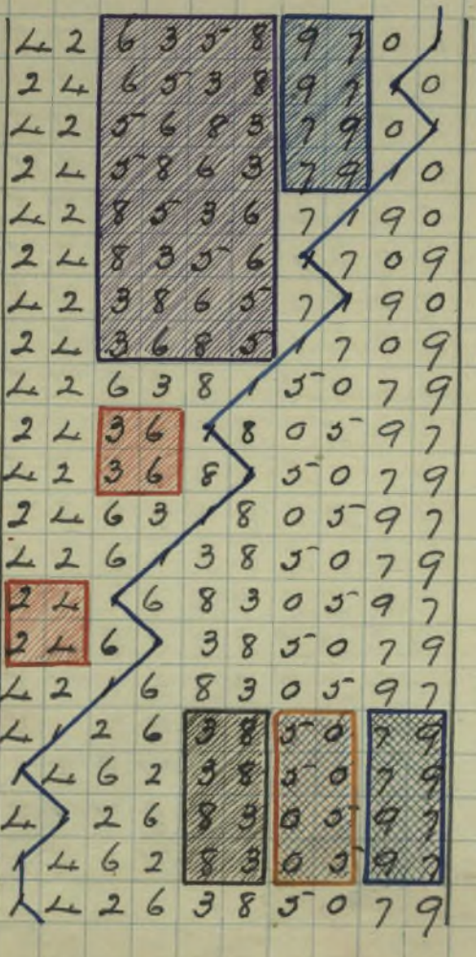


See p.p. 331 – 334
also p.p. 370. – 372.

B.







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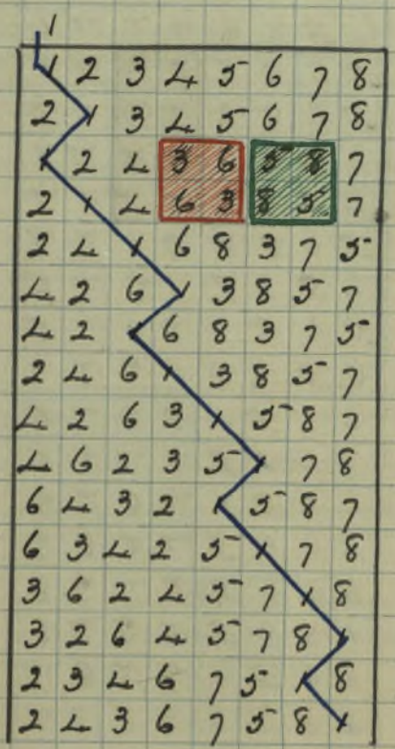
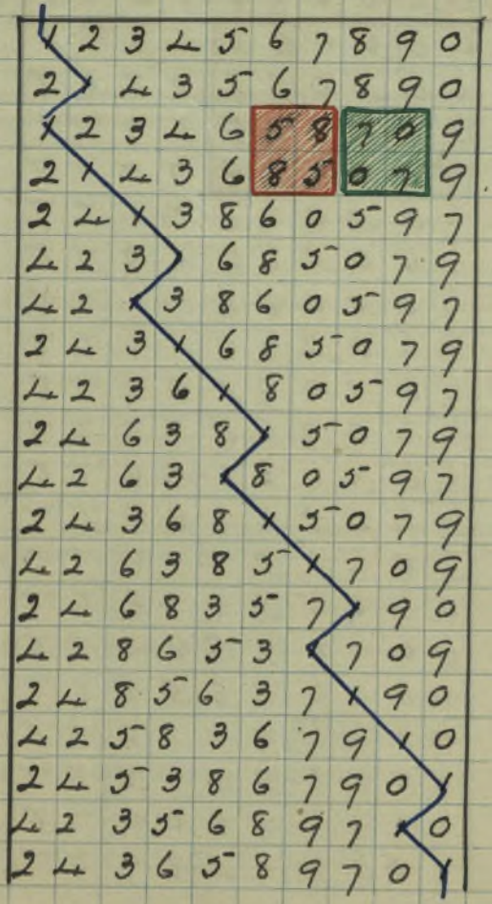
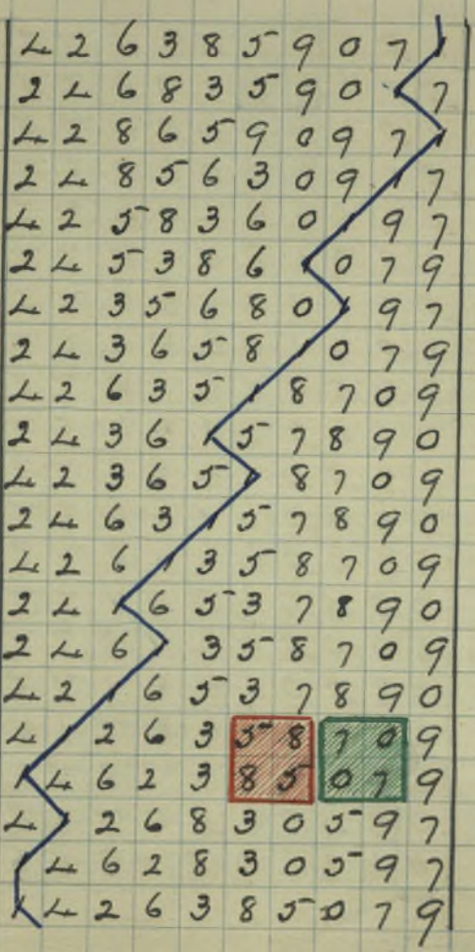
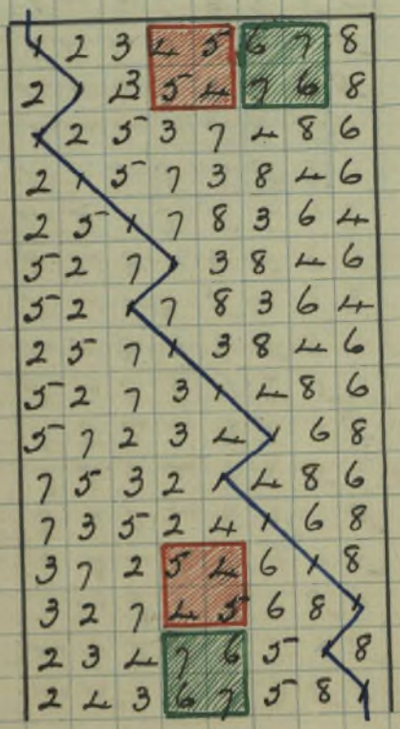
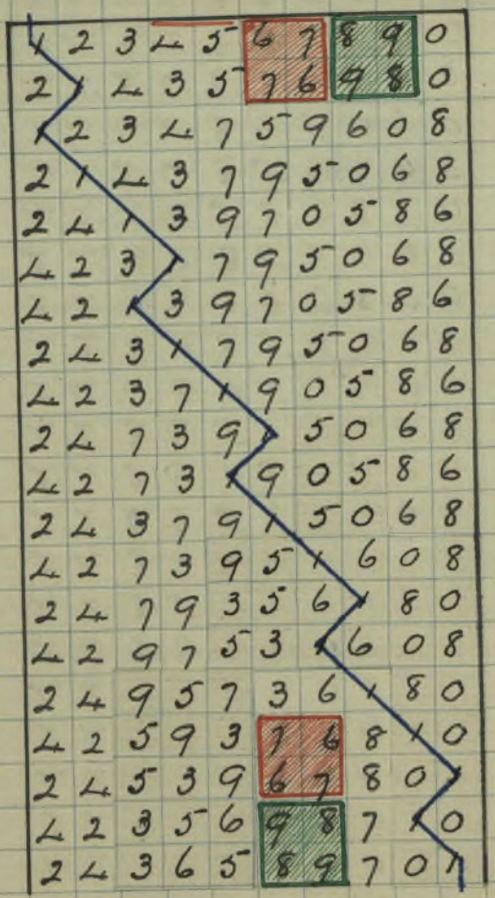


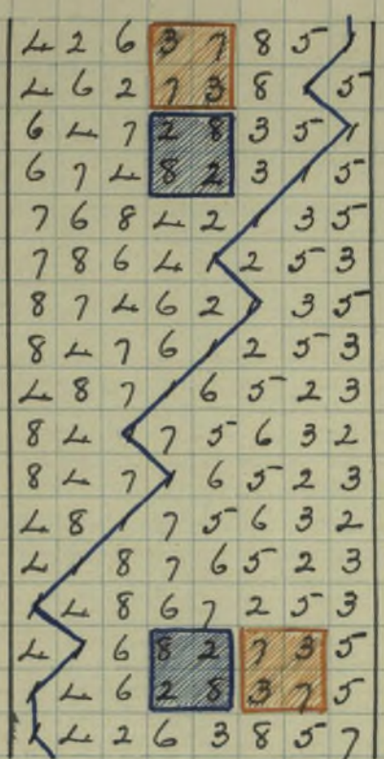


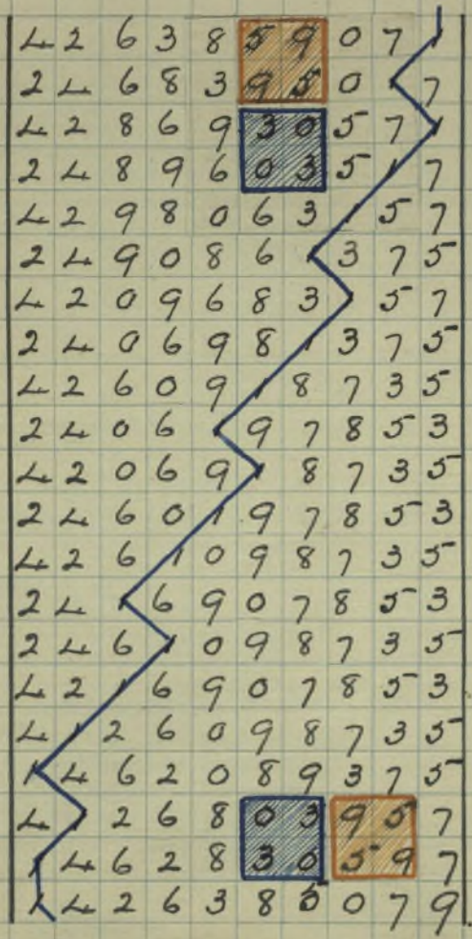


D.









Extension by adding to the number of Hunts. The nature of cyclical movement is such that, every method in which the main construction consists of Hunts and Extreme Bells, can be extended by adding to the number of the Hunts in arithmetical progression. As the expansion of the Plain Principle is equal, the capacity of Plain Methods to extend in this way is entirely unrestricted. The formula on page 394 will so far as the Hunts are concerned apply to every one of these Methods. If we examine the Example given on p. 297 we shall see that as the number of Extreme Bells remains constant on all numbers, the room available for making Constructional and additional Hunts remains constant also. This room consists of four triangles, and the relationship between these triangles remains the same. And if, as in that example, we retain the same symbols for the Extreme Bells on all numbers we find that the work within these triangles is represented by exactly the same figures. I have dealt with this

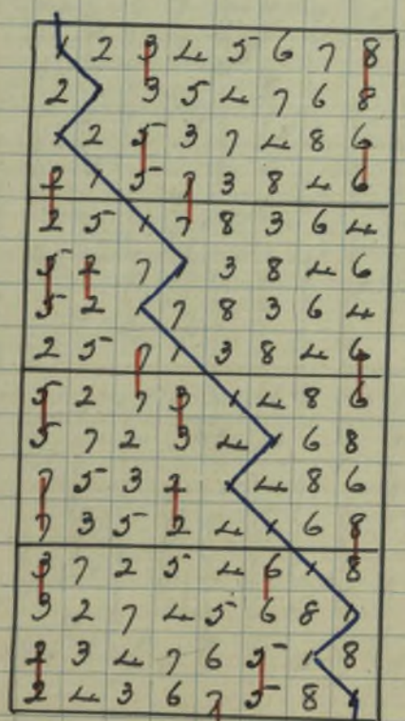
form of Extension at considerable length and detail in an article in the Bell News on Odd and Even Bell Methods.

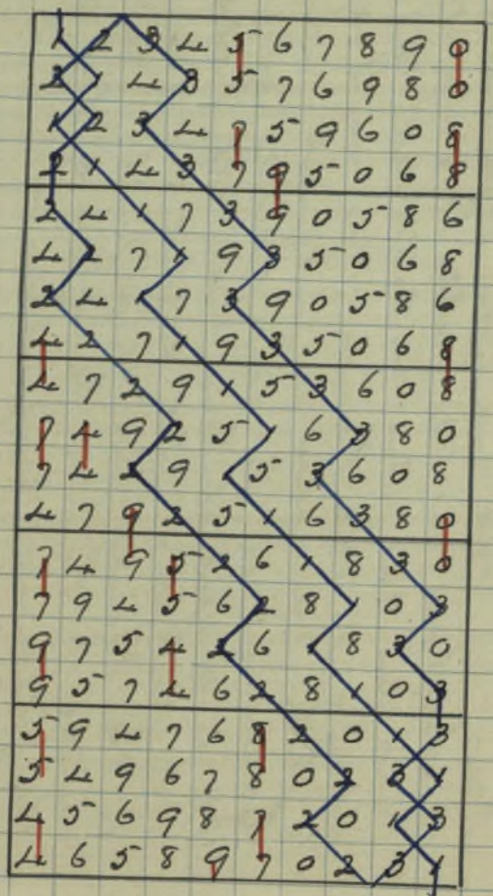
Methods on the Treble Bob and other Principles can also be extended by adding to the Hunts; but as the expansion of those Principles is unequal such Extension is, to some extent restricted. It is a general law that all Treble Bob Methods will extend by adding to the Hunts two at a time, the number of Hunts being in either of the following Progressions —

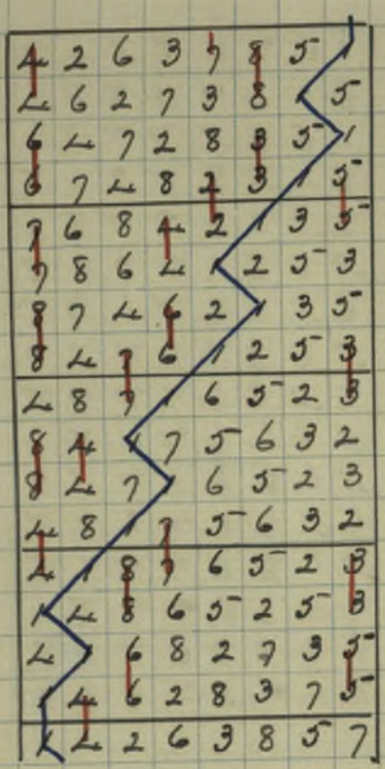
1 3 5 7 9 11 13 —→

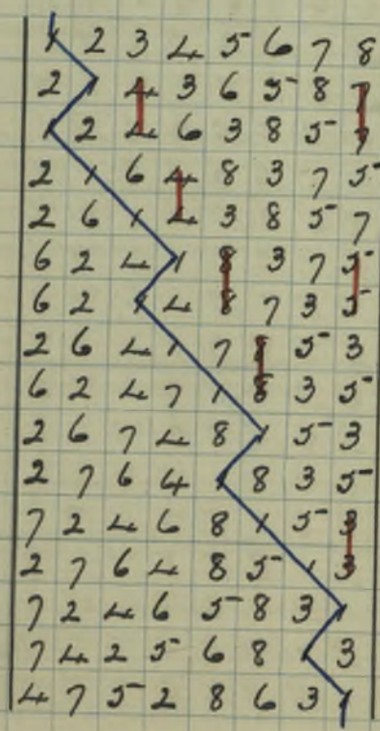
2 4 6 8 10 12 14 —→

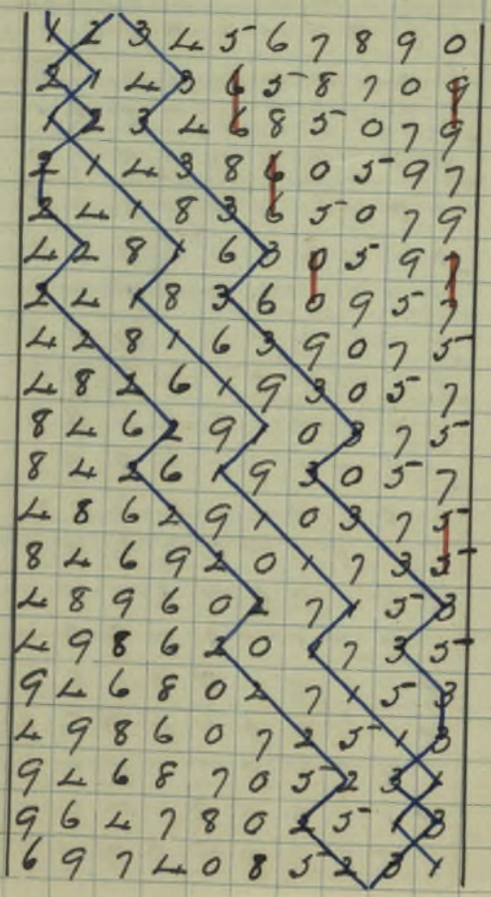
Since, however, the number of Sections increases in regular ratio, but the number of Hunts, designed to counteract the natural falseness of those Sections, remains constant, any Extension of a Treble Bob Method by adding to the Hunts must contain repetitions of Rows. The following are two examples. It will be seen that in the case of London the falseness at once appears. In the case of Cambridge it does not appear until twelve bells are reached.

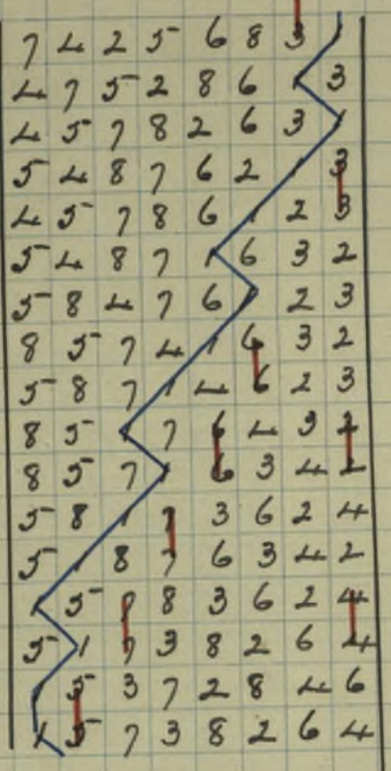


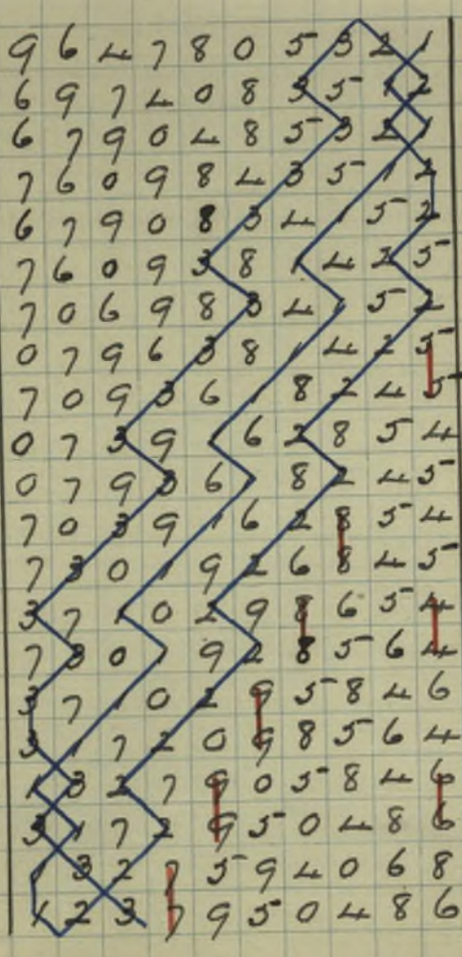












The progression of the Rows and the Diagram of the Method.

In the Extension of any Method, produced by a progression of Shifts (i.e. of Cyclical Movements), every other essential feature of the Method will also be in progression. The more important of these features are two, which in themselves comprise or imply most of the others. They are the Diagram of the Method (or Skeleton Course) and the Rows. The first represents the work of an individual bell; the other the combined result of the works of all the bells. No Extension can claim to be a true Extension in which these two are not in progression.

It is the fashion to say that an Extension must be the same Method, but on a larger number of bells; and in a very real sense this is strictly true. We can define a Method as an abstract entity consisting of certain rules for producing movement among the bells, which has a greater or less capacity for expressing itself on different numbers. The expressions

will differ somewhat, the thing itself always remains the same. Hence we get the "essential" and the "accidental" features of a Method. When you come to think of it, this is how in a misty and undefined way an ordinary ringer does consider a Method. Stedman is to him not merely the sum of Stedman Doubles, Triples, Caters and Cinques. It is something wider, which is behind them, and of which they are the expressions under peculiar circumstances. But directly the ringer tries to reduce this vague idea to something definite, he goes astray and gets involved in errors and contradictions. When he comes to put his Extension down on paper he talks about the work being the <u>same</u>, the Lead Ends the <u>same</u> and so forth. But, quite obviously, a Row of six bells cannot be the <u>same</u> as a Row of four bells. Hence though the idea that men are trying to express is, in the main, a sound one, yet the accepted statement that "an Extension must have the same Lead Ends as its original" is quite unscientific. Even if, as I did, you substitute for the word "same" the more plastic word "equivalent,"

you think the difficulty rather than remove it. For the truth is that no Row has an exact equivalent on a higher number. Even if we admit (as I do not) that given 135264 as the six bell Lead End, the eight bell Lead End must be 3527486; and given 142635 as the six bell Lead End, the eight bell Lead End must be 14263857 — how are we to decide what is the same on eight that 6452 3 is on six? Is it to be 64827 35 or 867452 3? And if either how can we tell that there is not a third or that there are not alternatives in the first two instances given?

These difficulties disappear when we consider an Extension as a progression but there are still things which require explanation

A		B.	
	342		423
	3524		42 53
	35264		42635
	352746		426375
	3527486		4263857
	35274968		42638597

These quite obviously are in progression. So too are the following —

C. 3 ∠ 2
5̄ 6 3 ∠ 2
7 8 5̄ 6 3 ∠ 2
9 0 7 8 5̄ 6 3 ∠ 2
E T 9 0 7 8 5̄ 6 3 ∠ 2.

But now take the following –

D ∠ 2 3
5 ∠ 3 2
5 6 3 ∠ 2
5 7 3 6 2 4
5̄ 7 3 8 2 6 4.

E 3 ∠ 2
5 ∠ 3 2
6 ∠ 5̄ 2 3
6 ∠ 7 2 5̄ 3
6 ∠ 8 2 7 3 5̄

F 6 ∠ 5̄ 2 3
7 8 5̄ 6 3 ∠ 2
7 9 5̄ 0 3 8 2 6 4
7 9 5̄ E 3 T 2 0 ∠ 8 6.

G 5̄ 6 3 ∠ 2
8 6 7 ∠ 5̄ 2 3
8 6 0 ∠ 9 2 7 3 5̄.

If these were merely arithmetical figures it might be rather difficult to say that they are all line progressions throughout. It might be rather difficult for instance to justify the position of ∠23 in D or 3∠2 in E. But they are not merely arithmetical figures. They are symbols which stand for the positions of moving

bells. They must be read in connection with the previous Lead End and the Causing Order of the Method. Rounds is assumed to be the previous Lead End in each case. At that point the bell Causing two positions in front of the Treble is, on four bells, the 4th; but on all other numbers the 5th Again; the first bell in the series E represents on four bells, the bell Causing next before the Treble; on five bells the bell Causing (at the previous Lead End) two positions in front of the Treble; on six bells, three positions in front; on seven bells four positions in front. These bells are represented by the figure 3 on four bells, 5 on five bells and 6 on all other numbers. Read with reference to Causing Order all these series of Lead Ends are in strict progression.

It is in this sense and in this sense alone that a Method and its Extensions must have the same Lead Ends.

Having agreed that an Extension must have the same Lead Ends as its original, most Composers are content to let the

matter rest there. What happens to the interior Rows is with them largely a matter of chance. But apart from its position, and apart from the fact that often it may stand for the signature of the Lead, as the Course End does of the Course, there is no real reason why the Lead End should be treated as different from any other Row. If it must be in a progression, so must they.

But the expansion of a Method is unequal, it may have several factors, and this necessarily results in the progression of the internal Rows being more or less involved. Especially is this the case where those Rows are the results of one or more Add: Shunts.

H 4 2 6 3 7 8 5
4 2 6 3 8 5 9 0 7
4 2 6 3 8 5 0 12 [illegible] 12 9.
4 2 6 3 8 5 0 12 13 14 11
4 2 6 3 8 5 0 7 12 9 14 11 15 16 13
4 2 6 3 8 5 0 7 12 9 14 11 16 13 17 18 15

These are the Half Lead Ends of the Extension of London Major given on page 389. It is

not difficult to see that there are in a fine progression, (though not in so simple a one as the series A to G), nor to trace from the figures on pp 386-9 the effect of the various Shunts.

The Half Lead Ends of Cambridge are in a more involved progression –

J 2 5 6 4 3
7 4 2 5 6 8 3
4 7 0 8 2 5 6 9 3
11 8 4 7 0 12 2 5 6 9 3

This progression can perhaps best be understood as follows. –

x 3 2 4 6 5
3 2 4 6 8 7 5
3 2 4 6 8 0 9 7 5
3 2 4 6 8 0 T E 9 7 5

y. 3 6 2 5 4
3 6 2 7 4 5 8
3 6 2 0 4 7 8 5 9
3 6 2 0 4 E 8 7 T 5 9

x is the Coming Order of the previous Lead End.

In x mark the fourth bell and every alternate bell following, as well as the last bell. Then write the figures down, alternately a plain figure and a marked figure. This will give 7, which is the Covering Order of 5, the Half Lead End. Why x should be so marked can be seen by examining the method and the effect of its Shunts.

Similarly it will be found that in a fine Extension all the internal Rows will be in a more or less involved progression. It will sometimes be well to consider the part of the Row above or below the Hunt by itself, and afterwards adjust the relationship of the two Halves.

The first of the following examples is from the Extension of Durham Surprise Minor p 385; the two following from the Extension of London Surprise Major p. 389.

Progression of Rows.

No of Bells	No of Row	Row.
6	10th.	6 4 2 5 3 1
8	10th	6 4 2 8 7 1 5 3
10	10th	6 4 2 8 0 1 9 3 7 5
12	10th	6 4 2 8 0 1 T 3 E 5 9 7
14	10th	6 4 2 8 0 1 12 3 14 5 13 7 9 11.
8	8th.	2 5 7 1 3 8 4 6
10	12th	2 4 3 7 9 1 5 0 6 8
12	16th	2 4 3 6 5 9 11 1 7 12 8 0
14	20th	2 4 3 6 5 8 7 11 13 1 9 14 0 12.
16	24th.	2 4 3 6 5 8 7 10 9 13 15 1 11 16 12 14
8	12th	7 3 5 2 4 1 6 8
10	16th	2 4 9 5 7 3 6 1 8 0
12	20th	2 4 3 6 11 7 9 5 8 1 0 12.
14	24th	2 4 3 6 5 8 13 9 11 7 0 1 12 14
16	28th.	2 4 3 6 5 8 7 0 15 11 13 9 12 1 14 16.

Ad. inf.

The progression of the Diagram of the Method. More important even than the progression of the Rows, it is, that the Diagram of the Method should be in a true progression, in an Extension. For this represents the movement - the work - of the bells, which alike in theory and in practice is the really essential feature. Men say that in an Extension, the work must be the same as in the original. But in any strict sense of the word this is impossible. Even in the obvious Extensions of the simple Methods you will find features which are altered. As in Stedman where on five bells, one plain hunts from front to back, and from back to front; but does not do so on any other number. Or in Cambridge where in Minor and Major a bell does the same thing, but not on any other number. Or in Forward where the Minor is double but the Extension to other numbers is not. You cannot have the same work in an Extension; what you can have is a progression of the work. As Expansion is unequal, and there may be more than one factor in the progression, the progression will in no

* page 279.

case be a simple one, and in many cases will be a very involved one.

As a result of the inequality of expansion the relative prominence of some work will differ in the various members of an Extension We saw that this is so in Forward.* Equally it is so in Kent. Another good example of this is in the Extension of London given on p. 389. Anyone who has rung London, or who has examined the method analytically, cannot fail to have noticed that, superficially, the most prominent feature of the Major is plain backward hunting. In the Extension I have given the relative prominence of this backward hunting steadily decreases, till on a very large number of bells it appears almost insignificant. On the other hand the relative prominence of dodging steadily increases. Almost unnoticed on eight, it becomes on the higher numbers, superficially, the most prominent feature. In this the Extension is obeying a general law, inherent in the nature of a progression of Shunts, and more or less common to all Extensions; especially of Methods which contain Additional Shunts.

In actual ringing there are many features which necessarily have great prominence and are really of great importance, but which in their nature belong to the accidental and not to the essential part of the Method. Such are those which I have mentioned in connection with Stedman, Cambridge, and Forward. And such too are many familiar features of other Methods. For, by the essential nature of ringing, all work is resolvable into Forward and Backward movement, either on all the bells or on a sectional part of them. This includes all Places whether internal or external. A Whole Turn is only three steps of Forward Hunting, followed by three steps of Backward Hunting, or vice versa. The same combined movement produces the Half Turn, and the Single Fourths or Single Fifths of Bristol. The difference is merely in the position of the bells involved. Again the 6-5-6 and the Long Fork of London are the result of partly Forward Treble Bob Hunting and partly Plain Hunting backward. And since expansion is unequal, it may well be that a line

1 C. The Same that produces the Whole Turn.

progression of movement will fail to reproduce these features exactly as in the original. A good example of this is found in the case of Double Norwich. The Exercise has generally agreed that on paper at any rate, Double Norwich Major, Royal, and Maximus are the same Method. But so far as practice is concerned, many ringers, perhaps the majority, would agree with Sir Arthur Heywood in saying that "the relationship of Major to Royal and Maximus is so slight as to make them to all intents and purposes different methods" *
Yet the extension of the movement is on a perfect progression, and provided the accidental features are ignored a set of rules can be laid by which all three can equally well be rung. In the same way that many men ring Plain Bob Minor and Major, i.e. by combining the steps of plain hunting between the dodges.
Rightly to judge of the movement of the bells in an Extension, one should have full diagrams of the Method on at least three numbers of bells, preferably more.

* "Duffield" page 5. For many years I held a similar opinion which led me to doubt if the Extension were, even in theory, a sound one.

I cannot give such diagrams here, considerations of space forbid; but I give some formulae showing the progressions of movement in the Extensions of various methods. These progressions are of increasing complexity, and naturally the progressions of some other Extensions will be much more involved still. They will not however differ in nature from those given. As each term represents the path of a bell it must be read cyclically.

Formulae of the Progression of Work.

In the following Forward Hunting is marked +. Backward Hunting −
External Places are included in the Forward and Backward Hunting
Internal Places which are part of hunting on a sectional number of bells are for convenience specially marked.

E = The Internal Place of an Extreme Shunt

C = The two Places of a Court Shunt with the movement joining them.

K = A pair of Kent Places (i.e. three steps of backward hunting in two positions.

P = Three steps of Forward Movement in the first two positions i.e. Seconds and a whole Pull Before.

T. = +3-1 i.e. ordinary Treble Bob Hunting

1. PLAIN BOB. One Hunt.

No of Bells				
4		E	$(+7-1)^2$	+7
5		E	$(+9-1)^3$	+9
6		E	$(+11-1)^4$	+11
7		E	$(+13-1)^5$	+13
8		E	$(+15-1)^6$	+15
9		E	$(+17-1)^7$	+17
10		E	$(+19-1)^8$	+19
11		E	$(+21-1)^9$	+21
12		E	$(+23-1)^{10}$	+23

Ad inf.

2 FORWARD.

6		K	+2 -1	+3 -1 +2	K	+2 -1	$(+3-1)^1$	+2
8		K	+2 -1	+3 -1 +2	K	+2 -1	$(+3-1)^3$	+2
10		K	+2 -1	+3 -1 +2	K	+2 -1	$(+3-1)^5$	+2
12		K	+2 -1	+3 -1 +2	K	+2 -1	$(+3-1)^7$	+2
14		K	+2 -1	+3 -1 +2	K	+2 -1	$(+3-1)^9$	+2
16		K	+2 -1	+3 -1 +2	K	+2 -1	$(+3-1)^{11}$	+2
18		K	+2 -1	+3 -1 +2	K	+2 -1	$(+3-1)^{13}$	+2

Ad inf.

3 FORWARD Extension D page 283

6		$(K+1)^1$	+1 -1	+3 -1	+2	$(K+1)^1$	+1 -1	+3 -1	+2
8		$(K+1)^2$	+1 -1	+3 -1	+2	$(K+1)^2$	+1 -1	+3 -1	+2
10		$(K+1)^3$	+1 -1	+3 -1	+2	$(K+1)^3$	+1 -1	+3 -1	+2
12		$(K+1)^4$	+1 -1	+3 -1	+2	$(K+1)^4$	+1 -1	+3 -1	+2
14		$(K+1)^5$	+1 -1	+3 -1	+2	$(K+1)^5$	+1 -1	+3 -1	+2
16		$(K+1)^6$	+1 -1	+3 -1	+2	$(K+1)^6$	+1 -1	+3 -1	+2
18		$(K+1)^7$	+1 -1	+3 -1	+2	$(K+1)^7$	+1 -1	+3 -1	+2
20		$(K+1)^8$	+1 -1	+3 -1	+2	$(K+1)^8$	+1 -1	+3 -1	+2

5 KENT TREBLE BOB One Hunt.

6	+1 -1 +2	P^{4}	+1 -1 +2	K	+2 -1	T^{2}	+6	K	+2 -1
8	+1 -1 +2	P^{6}	+1 -1 +2	K	+2 -1	T^{4}	+6	K	+2 -1
10	+1 -1 +2	P^{8}	+1 -1 +2	K	+2 -1	T^{6}	+6	K	+2 -1
12	+1 -1 +2	P^{10}	+1 -1 +2	K	+2 -1	T^{8}	+6	K	+2 -1
14	+1 -1 +2	P^{12}	+1 -1 +2	K	+2 -1	T^{10}	+6	K	+2 -1
16	+1 -1 +2	P^{14}	+1 -1 +2	K	+2 -1	T^{12}	+6	K	+2 -1
18	+1 -1 +2	P^{16}	+1 -1 +2	K	+2 -1	T^{14}	+6	K	+2 -1
20	+1 -1 +2	P^{18}	+1 -1 +2	K	+2 -1	T^{16}	+6	K	+2 -1

6 DOUBLE OXFORD. One Hunt.

(The Formula represents the work of half a Course)

E	+3 -1	$(+1-1)^{2}$	+3 -1 +1	C	$(+1-1)^{1}$	+3 -1	$(+1-1)^{2}$
E	+3 -1	$(+1-1)^{4}$	+3 -1 +1	C	$(+1-1)^{3}$	+3 -1	$(+1-1)^{2}$	+1	C	$(+1-1)^{1}$	+3 -1	(+1
E	+3 -1	$(+1-1)^{6}$	+3 -1 +1	C	$(+1-1)^{5}$	+3 -1	$(+1-1)^{2}$	+1	C	$(+1-1)^{3}$	+3 -1	(+1
E	+3 -1	$(+1-1)^{8}$	+3 -1 +1	C	$(+1-1)^{7}$	+3 -1	$(+1-1)^{2}$	+1	C	$(+1-1)^{5}$	+3 -1	(+1

T^{2}	+7 -1	$(T^{3}$	+7 -1$)^{1}$	T^{2}	+2	K	+6 -1	T^{2}	+2	K	-1
T^{4}	+7 -1	$(T^{5}$	+7 -1$)^{3}$	T^{4}	+2	K	+6 -1	T^{4}	+2	K	-1
T^{6}	+7 -1	$(T^{7}$	+7 -1$)^{5}$	T^{6}	+2	K	+6 -1	T^{6}	+2	K	-1
T^{8}	+7 -1	$(T^{9}$	+7 -1$)^{7}$	T^{8}	+2	K	+6 -1	T^{8}	+2	K	-1
T^{10}	+7 -1	$(T^{11}$	+7 -1$)^{9}$	T^{10}	+2	K	+6 -1	T^{10}	+2	K	-1
T^{12}	+7 -1	$(T^{13}$	+7 -1$)^{11}$	T^{12}	+2	K	+6 -1	T^{12}	+2	K	-1
T^{14}	+7 -1	$(T^{15}$	+7 -1$)^{13}$	T^{14}	+2	K	+6 -1	T^{14}	+2	K	-1
T^{16}	+7 -1	$(T^{17}$	+7 -1$)^{15}$	T^{16}	+2	K	+6 -1	T^{16}	+2	K	-1

$-1)^{4}$													+3	C
$-1)^{4}$	+1	C	$(+1-1)^{1}$	+3 -1	$(+1-1)^{6}$								+3	C
$-1)^{4}$	+1	C	$(+1-1)^{3}$	+3 -1	$(+1-1)^{6}$	+1	C	$(+1-1)^{1}$	+3 -1	$(+1-1)^{8}$	+3	C

7. DOUBLE NORWICH — One Hunt.

The Formula represents the Work of one quarter of the Course.

8	C	+1	-1	+5	-1	+1	-1	+3	-1													+1	-1	+5	C
10	C	+3	-1	+5	-1	+3	-1	+3	-1	+5	-1	+3	-1									+3	-1	+5	C
12	C	+5	-1	+5	-1	+5	-1	+3	-1	+7	-1	+3	-1	+7	-1	+3	-1					+5	-1	+5	C
14	C	+7	-1	+5	-1	+7	-1	+3	-1	+9	-1	+3	-1	+9	-1	+3	-1					+7	-1	+5	C
16	C	+9	-1	+5	-1	+9	-1	+3	-1	+11	-1	+3	-1	+11	-1	+3	-1					+9	-1	+5	C
18	C	+11	-1	+5	-1	+11	-1	+3	-1	+13	-1	+3	-1	+13	-1	+3	-1	+13	-1	+3	-1	+11	-1	+5	C

Ad int.

Note

In the last Chapter I showed that capacity for Extension is not an exceptional quality confined to a small number of Methods, but is a characteristic of most Methods and is limited only by local considerations. Further I showed that many Methods have more than one equally valid Extension. The question is still open - How far are these Extensions entitled to be called by the same name as the original? This is outside the scope of the present book. I have shown for instance what are the true Extensions of Bristol Surprise Major, but I do not here and now express any opinion as to which is Bristol Surprise Royal or whether there is such a Method.