PREFACE

It showed again that an editor of historical, musical press cannot receive, discuss, and publish a paper. Wherefore this article had to be published in my own edition. A presentation of the problem is given in the APENDIX.

My acknowledgements go to "Larry" for his very qualified philological advices to the original manuscript. To the English painter John Herron for correct judgement of "Dr." Rycroft: A big laughter and..."The will of understanding must also be there!"
Further, to Dr.Juris John Griffiths in Groningen for typing and slight adaptions to legal frames of reference.

I also give my thanks to Frans Brüggen and Michel Piguet for allowing me to examine their recorders, to Dr. Rob van Acht at the Gemeentemuseum in Den Haag for letting us examine the Wijne Traverso, and to Martin Kirnbauer, Germanisches Nationalmuseum in Nürnberg for a copy of his article on the Nürnberg recorders.

An AD-EQUATE (!) way of making oneself aquainted to the described system is to try and repeat an original instrument from existing modern millimetrical maps, avoiding any taken measurement on the physical workpiece exept for points that coincide clearly with the Penta- dyadical system. It shows that coincidence shows up where it is actually needed from the experienced woodturners point of wiew. The used arrangements in original instruments may be quite surprizing, as one will see at both of the ends of the Steenbergen recorder. It may take quite a lot of intuition rather than blind trial and error according to a rigid theory by statistics, to crack such a REBUS. And when order is found, it rather stands out as a quite conscious, matematical poem! Wherefore I do not recommend any programmable computer for the analytical work. But a pocket computer has shown quite useful for finding order in modern maps that were measured according to other theories.

Permit me to say that we assume solid, practical experience in the laboratory, in science. Wherefore I, as a chemist etc. simply disqualify minds who believe that verbal work is "upstairs" and empirical, physical examination is "downstairs". That attitude is professionally and historically provincial.
Take Sir Isaac Newton as your good example. He was invited to The Royal Society because of his quite superbe telescope. And despite of some inferiour speculations about falling apples that had to be swallowed with the telescope.

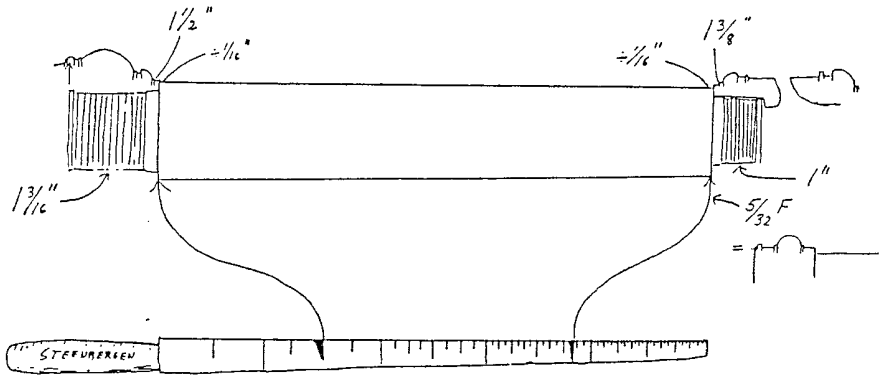
And if any editor of historical, musical research- press should need advices on how to capture basic discoveries like this for his periodical and regardless of which FACULTY or nation it comes from, then simply ask me how to receive and to discuss an unpublished research- manuscript. Or simply ask any responsible scientifical edition or patents office. Do that! because it may prevent you from getting quite famous and laughed at, on the wrong side of research, in the future.

Groningen 8 May 88
Sverre Kolberg

3rd edition
Groningen 9-7-90
S.K.

SVERRE KOLBERG

Ornamental Metrics of Recorders & Traversos



BY IRREFUSEABLE PROCEDURES

GRONINGEN ANNO MXM

A PENTA-DYADICAL COORDINATE SYSTEM UNCOVERED IN THE ORNAMENTAL METRICS OF BAROQUE RECORDERS AND TRAVERSOS

The coordinate system described in this paper was found in Fred Morgan's mapping of Frans Brüggen's Steenbergen recorder.[1] It coincides with that of other historical woodwind instruments.[2] [3] [4] It will be given a thorough, practical and detailed technical analysis in *Figurazione III* (forthcoming).[5]

The purpose of this article is to call the discovery to the attention of English scholars, museum staff and historical instrument-makers. It seems to be an important key to the metrical thought of a large group of early woodwind instrument-makers, represented in England by Bressan, the Stanesby's, and others. It is important that English museum instruments also be analysed in the way described here.

The measuring technique described has been carried out in practice for more than a year. It considerably eases the work on the lathe, as compared with current millimetrical and surface-incremental methods of copying old instruments. All points that are technically essential for conserving the 'style' of an instrument can be expressed in terms of rational proportions which are easily kept in mind after some training. The instrument-maker can concentrate better on the aesthetic side of his work because not distracted by having continually to refer to descriptions expressed in terms of irrational metrical magnitudes.

It will be noted that the analysis here concerns only the exteriors. For bore-metrics, I refer to *Figurazione II*.[5]

Units and metrical tools

The unit of exterior length is one fifth of the sounding length. The sounding length of a recorder is defined as the distance from the block to the distal end of the instrument. For purposes of the system being described here, one takes the ornamental ring above the window as the upper reference point for the sounding length: that seems to have been the initial reference point and was kept under strict control. In the case of traversos with a moveable cork, I have found quite convincing accuracy in the rest of the metrics if one takes the lower end of the blowing hole as the upper reference point for the sounding length. I cannot guarantee that these points will always be valid. If experience reveals poor coincidence, one should look for a better reference point for defining the sounding length.

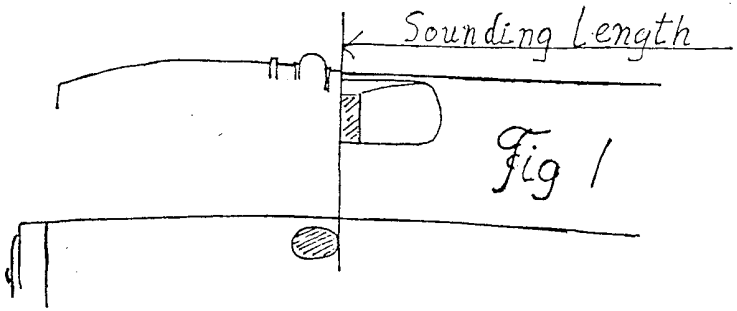


Fig 1

The sounding length (SL) is divided into five. The 'flute-inch' (symbol: F) is then defined: F = SL/5. This unit is further divided dyadically, like the conventional inch, in halves, quarters, eights, and down to 1/32. These divisions should be engraved on a wooden stick as shown in fig. 2 and 5. This ruler will be very useful for the examination of 1:1 mappings of original instruments and for the reconstruction of such instruments.

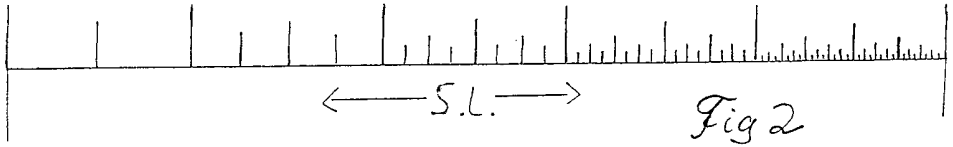
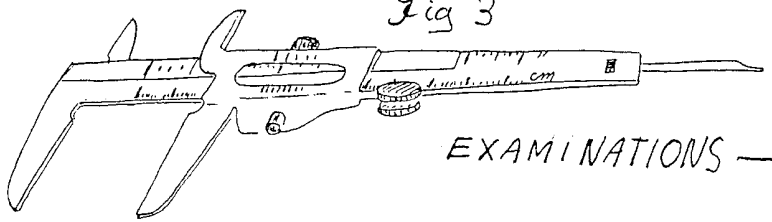


Fig 2

The diameters of recorders seem to have the bore-diameter at the window (BD) as their unit. This unit is represented by the conventional inch-symbol (") in the following discussion. It should be noted that the exterior diameter at the window is exceptional on all the recorders analysed here: in English recorders one often finds the great sext. 5/3" at this point.

For the examination of bore diameters I recommend a cheap metal caliper, graded in inches and millimeters. A bore-inch scale can be made by gluing a thin metal strip on top of the original scale with cyanoacrylate. Calculate the new inch-intervals from BD milimetrically and engrave them on the new scale. With this caliper, one can compare millimetrical mappings directly with dyadical divisions of BD. For instrument-making purposes and for measurements on historical instruments, I recommend that one make a noble ruler of boxwood boiled in oil, to which one can fit exchangeable scales of brass.

Fig 3



EXAMINATIONS →

Steenbergen Head
Brüggen Coll

Cal 8

1F = 1/5 SL = 88.92 mm
1" = BD = 19.45 mm

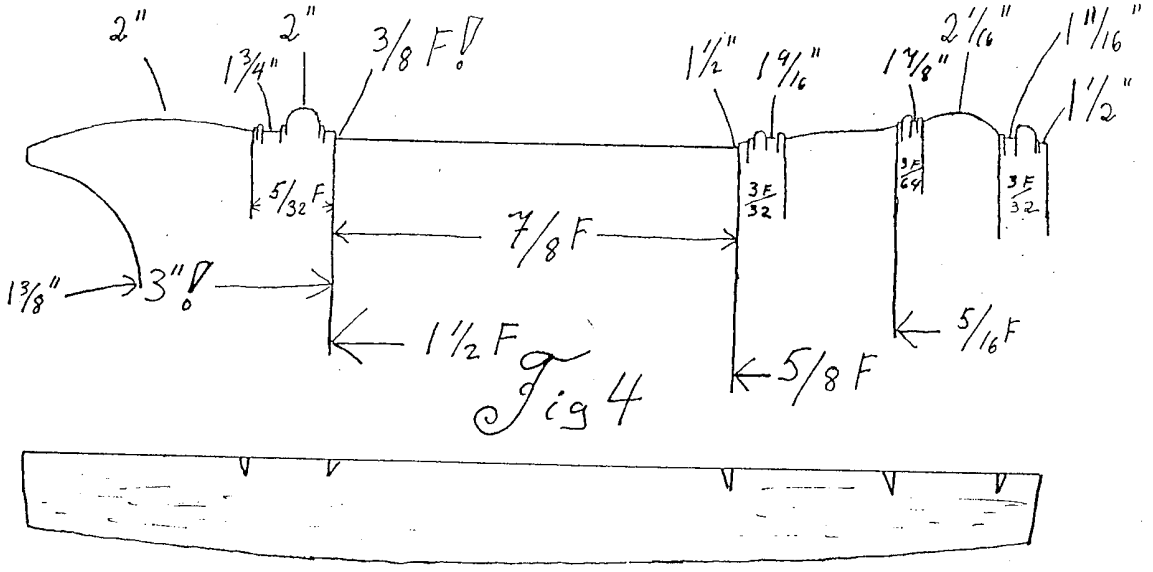
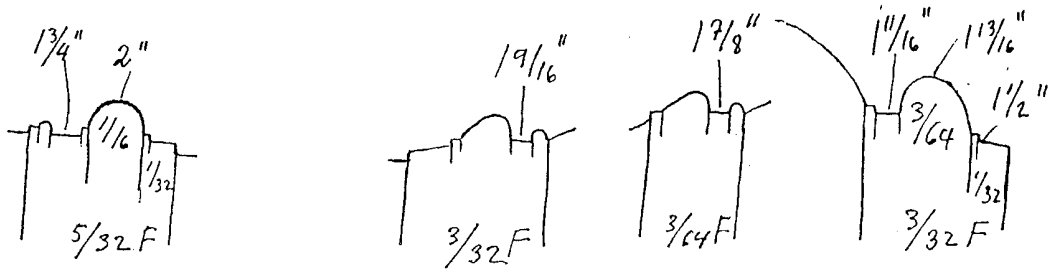


Fig 4



Sverre Kolberg
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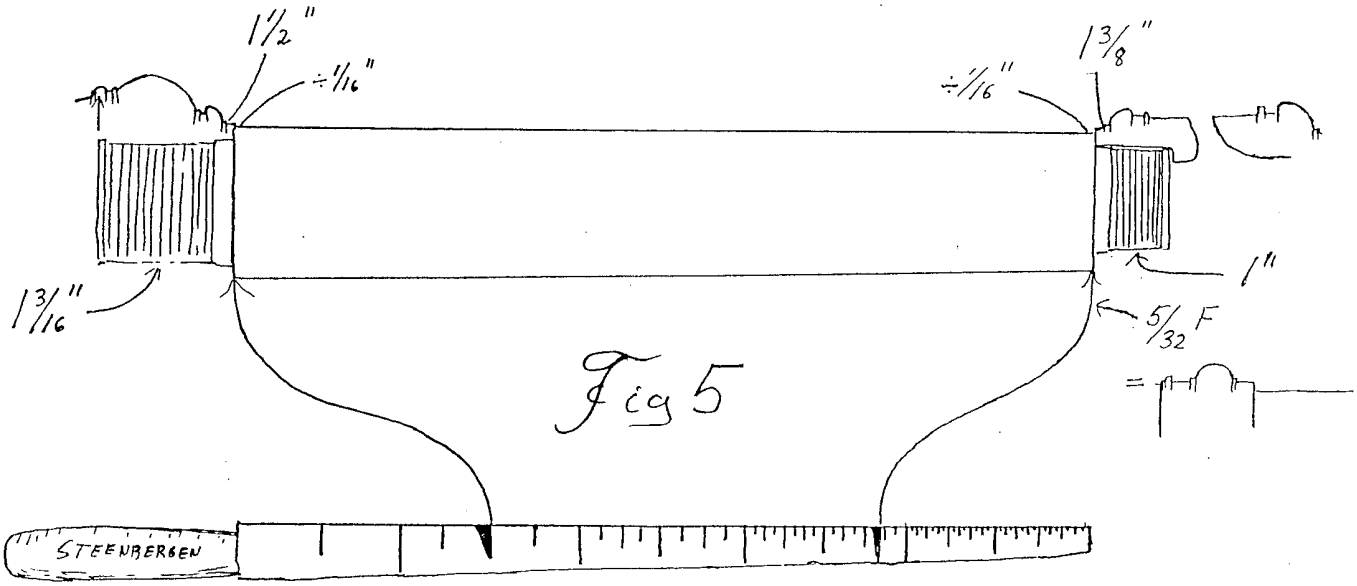
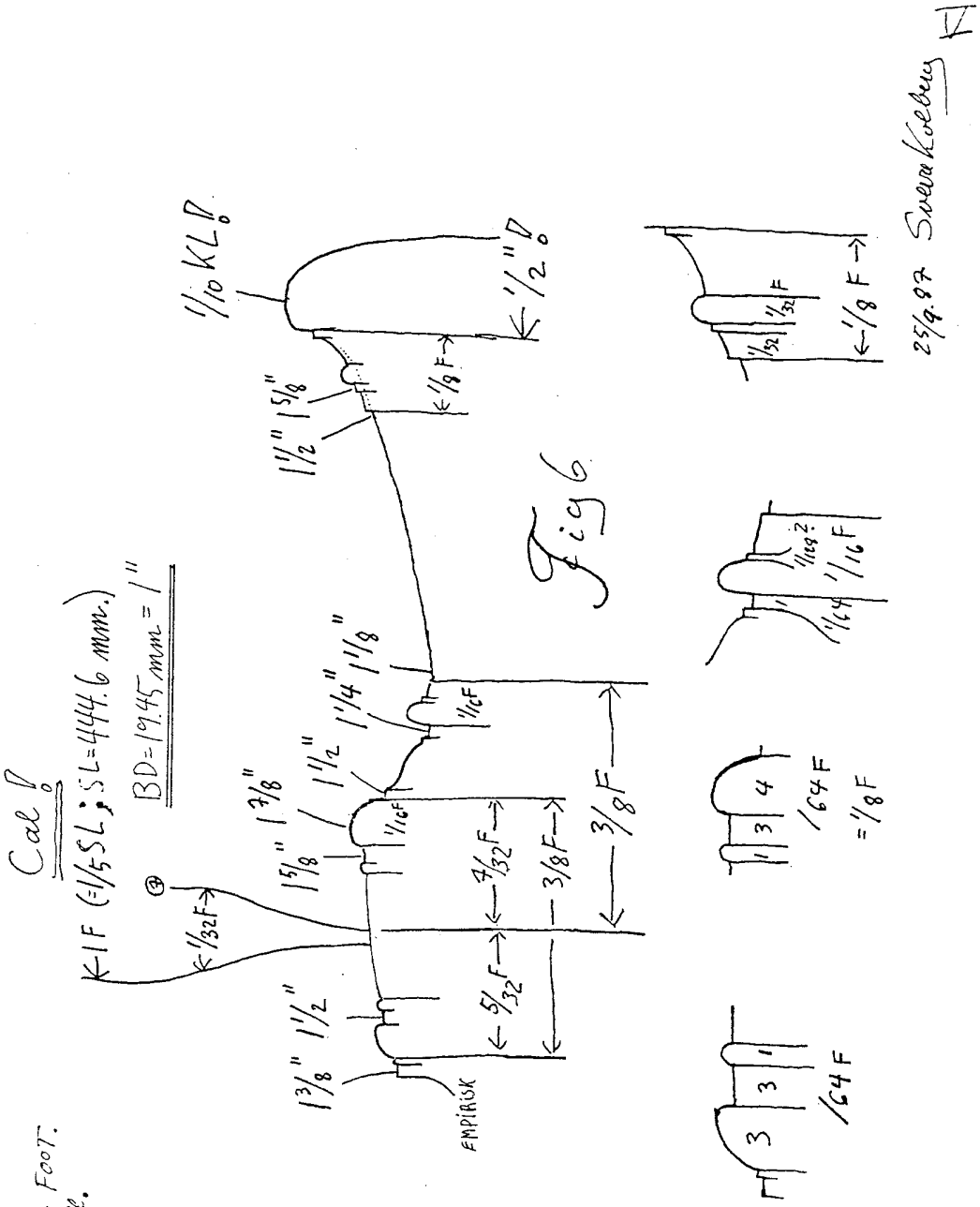


Fig 5



Steenbergen's recorder is highly accurate and shows good coincidence down into the minor ornamental details. Some details in the drawings are slightly irrational, such as the 2" Domus on the head-ring, which is a bit lower on the instrument acording to Morgan. I interpret this as due to shortage of ivory. Further, both ends of the middle-piece are slightly thinner than they should be, which seems to reflect a minor error in the work. Most interesting is an obvious exchange of the units at the two ends of the instrument. 3/8 F is taken for the diameter at the window and the beak is 3" long. 1/2" is the length of the distal dome in the end-piece and the diameter is 1/2 F (see fig. 6). The exchange of units is thus symmetrical. Perhaps this is a little joke of Steenbergen's.
The foot-manchette is centered to the 7th hole by rational, mathematical consideration, in order to adapt the asymmetrical manchette to the hole-position. This may seem surprising to a modern mind. 'Aren't the holes made in the flute?' No, it seems as though the visible parts of the flute were built out from the holes, whose location was determined by their musical function.

The long ruler (fig. 5) can hardly be used at the lathe. But smaller rulers including only the main points of the workpiece and with a full engraving of the F-unit on their other side (see fig. 4) have proven very practical. Whoever tries it out will discover that the dyadically-graded inch-ruler with BD as the unit is entirely superior to any other kind of grading for diameter measurements on the lathe. This is because all cuts get doubled on a lathe, which puts a strain on mental calculations using a decimal scale. With a dyadical scale, one can easily read and compare figures after some training.

Let us look at another instrument by another instrument-maker, Robert Wijne's traverso (see fig. 7). The maximum inaccuracy in the sectioning of the pieces is 0.7 mm. (remember that the sounding length - SL - is measured from the lower rim of the blow-hole). This finding on quite another instrument strongly confirms the theory. The same accuracy is not repeated in all of the ornamental details, but nonetheless there is obvious coincidence. The diameters of the instrument are still to be investigated, and only fragments of a hole-rule could be established. But the moral of this finding on Wijne's traverso is: check traversos and oboes as well as recorders.

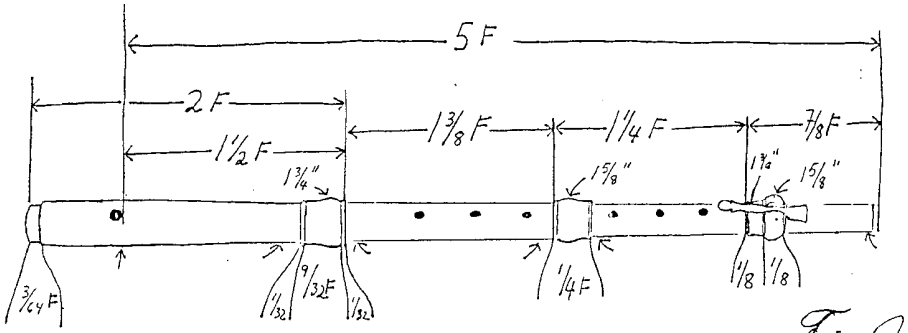


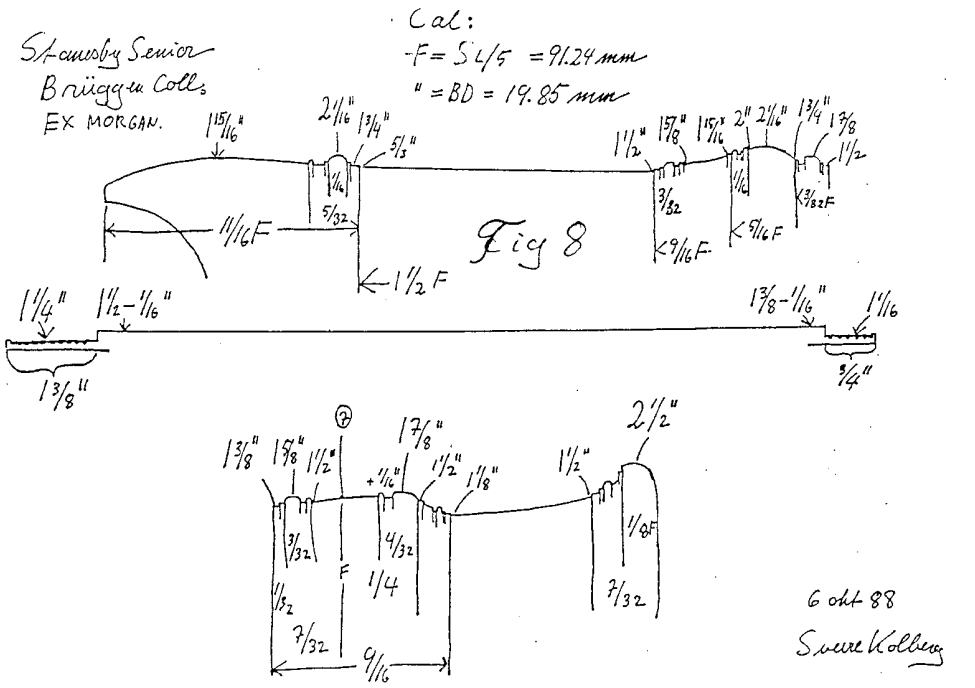
Fig 7

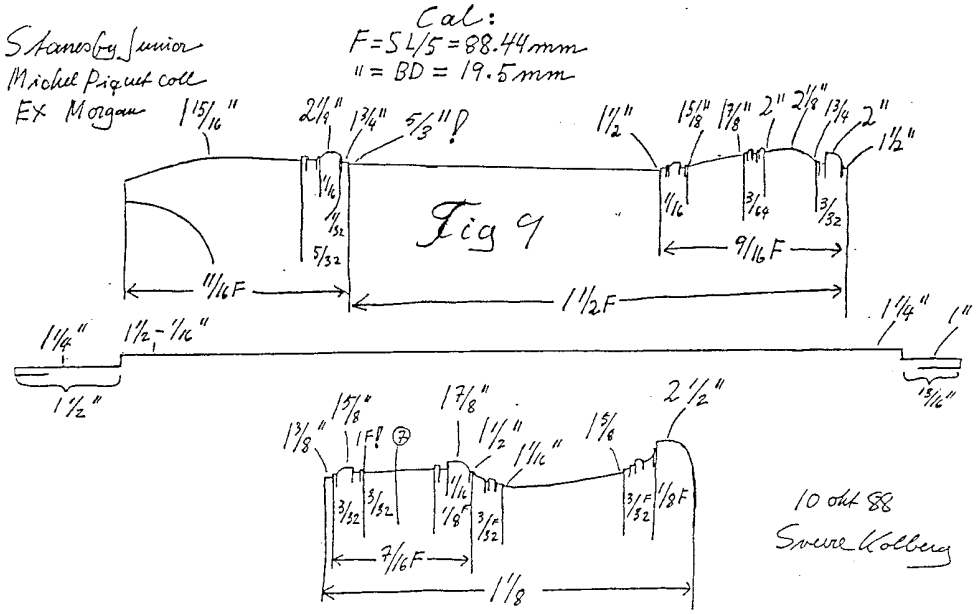
Robert Wijne Traverso
Gemeentemuseum Den Haag Ea 11-1935
Ex Marius Lutgerink

Cal: F=112.28 mm
BD = 1" = 19.5 mm

10-10-88
Sven Kolberg

To pursue the discussion further, I present an initial analysis of recorders by Stanesby senior and junior, according to Fred Morgan's mappings.[34]





These anayses have not yet been carried through into the smaller details and must be regarded as suggestions. I have not yet tried the analysis out practically on the lathe. Differences and similarities between the Stanesby's and Steenbergen, and between the two Stanesby's, are clear. The exchange of metrical units at the ends seems to be a trademark of Steenbergen. An aside: in the future, when talking about 'long-footed' and 'short-footed' recorders, the reference should be to the distance between the 7th hole and the F-unit in the foot (figs. 6, 8 and 9). The sectioning of the wood is acoustically irrelevant.

I have seen both Stanesby instruments. Stanesby senior had a bit rougher style of workmanship. Neither Stanesby seems to be highly accurate in the smaller ornamental details, but this may be a matter of personal attitude. I have noticed in my own work that when the system is known and one is well-trained in it, the smaller detals tend to be made with eye-measurement. I keep only a few control-points which I actually measure in order not to fall out of the style. I have allowed myself to adjust Morgan's measurements as far as details are concerned according to what we might call the Stanesby rule. But there remains coincidence enough to make plain that one has worked according to the penta-dyadical system.

It must be noted that one may search in vain for the BD and F units in 18th century units of length. These magnitudes define the pitch and the mensure (the BD/SL proportion). They are probably empirically derived. The convention which is borrowed from other aspects of contemporary culture is the dyadical division, which is an abstract principle of metrical mathematics.

It is the value of the unit rather than the proportions which are changed when an instrument of a different size or pitch is made. With some training it takes less than half an hour to engrave a new set of rulers.

Changing the value of the units while retaining constant proportions according to a simple, memorized formula, is also known in boat-building. It conserves a style and saves a great deal of work in calculation. It relieves one from constantly having to read and remeber irrational dimensions. It really is the elegant way of working.

One must, however, be aware that there may well be exceptions to the system. Examination of Martin Kirnbauers measurements of the Nürnberg recorders[6] shows that Denner senior and junior, Brèssan and Rottenburg made their head-proportions according to the system, whereas the head-proportions of Schell, Gahn, Zick, Staub and Oberländer show more irregularity. This may reflect different ideas of metrical mathematics. Martin Kirnbauer has suggested that historical instrument-makers may have worked with the standard inch, a possibility which ought to be examined, especially in apparently irregular cases. But Steenbergen, the Stanesby's, Wijne, the Denners, Bressan and possibly Rottenburg can be regarded as a group of instrument-makers with the same metrical philosophy, which was worked out differently in their various cases. This hypothesis should be tested further, among other possible members of the group. Such testing should be done in museums and by today's historical instrument-makers.

Hole positions

Classical musical acoustics has been preoccupied with the problem of hole-position in flute instruments. This preoccupation is entailed by the Newton-Euler-Rayleigh theory of the linear-elastic air-column (Newton's spiral spring with a load at the end, or the moving particles in a linear-elastic field). The column gets tuned, according to this theory, by varying its length. The theory is physically false because it is derived from the false assumption of a constant spead of sound (or module of elasticity) in space, inside an enclosure containing air, at musically relevant amplitudes. It also has the disadvantage of being based on particle speed rather than oscillating pressure, which is what ears and microphones react to. I must warn against that approach, and I refer the reader to *Figurazione II* for a better parametrical approach for dealing with the acoustics of wind instruments in a scientific way.

In historical woodwind instruments it is the bore rather than the hole-position that is adjusted for tuning purposes. It is therefore possible to place the holes according to criteria such as ease of grip and the length unit of the flute, and to adjust for minor errors of sound color and intonation by adjustments to the bore.

My hypothesis is that holes 2 and 5, the centers of the two grips, ought to stand at rational positions. Hole 7 is very critical for acoustical reasons and therefore must be well-defined in terms of smaller fractions of the length unit. The rest of the holes can be varied a bit to facilitate easier grip (especially in large instruments) and for the sake of appearance.

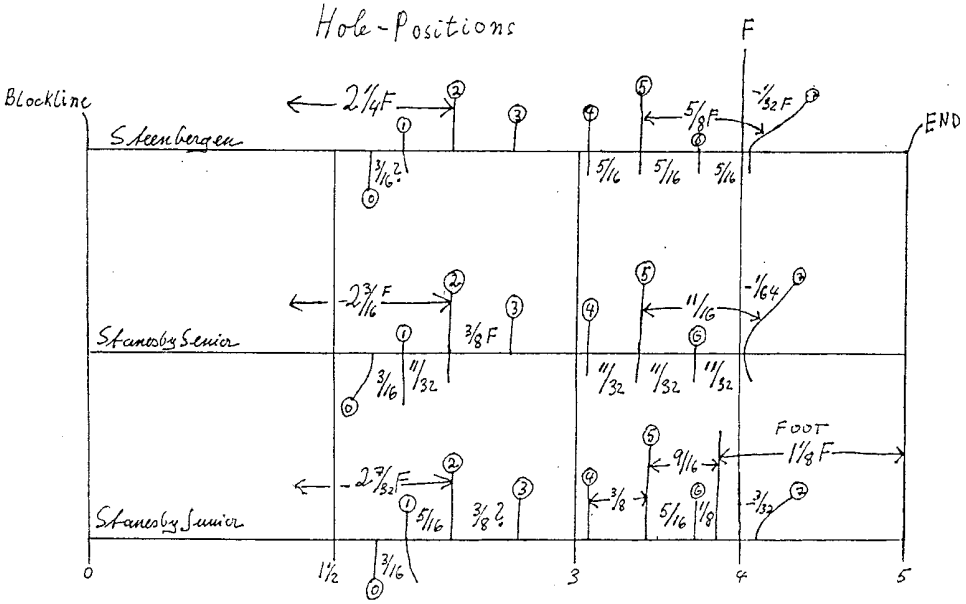


Fig 10

Figure 10 gives an analysis of the hole positions in three recorders. Only the analysis of the Steenbergen recorder has been checked in practice. The analysis of the two Stanesby recorders is based only on drawings and has not been checked on the lathe. I offer it only as a suggestion.

The Steenbergen formula is as follows. Hole 7 is 1/32 F below the 1 F unit in the foot. Hole 5 is 5/8 F above hole 7 and hole 2 is 2¼ F below the blockline. This is the basic arrangement. Then hole 6 is placed by eye-measurement halfway between holes 5 and 7 and hole 4 by eye at the same distance upward from hole 5. Hole 3 is placed by eye about halfway between holes 2 and 4, and hole 1 is placed not too far above hole 2. Care is taken to place the two triads of holes on the middle section are equally long, because this looks better. The thumb-hole is then placed-by eye-measurement - 3/16 F upwards from hole 1 (maybe half the external diameter of the middle piece at this point is used). This procedure has served me well in practice, and it is easily remembered.

I do not comment here on the Stanesby hole-positions because I do not want to confine the critical fantasy of the reader and I have not tried the analysis out in practice. The reader should be aware, however, that some instrument-makers may have adjusted the hole-positions on musical criteria, away from the positions required by a rational system. And some instrument-makers may have fixed the hole positions at unsystematic, empirically-determined places on a measuring device such as a wooden rod (a convenient practice in all sorts of wood-working). They may have refined such empirical positions further by means of geometrical projections. Such procedures will give very obscure results compared with systematic application of the penta-dyadical rule. Be aware that the penta-dyadical rule may have been applied in the ornaments but not to the hole-positions. Note also the possibility of adjusting the position of the holes in connection with variations in conicity - the 'rubber-rule' (see *Figurazione II*).

A parting observation: conventional musical notation also uses a penta-dyadical coordinate system!

NOTES

1. Alto recorder (I. Steenbergen). *The Recorder Collection of Frans Brüggen*. Zen-On Music Co. Ltd. ISBN 4-11-540600-3 C3073 5000E.
2. Traverso Den Haag Ea 11-1935 (R. Wijne) - collection Gemeentemuseum Den Haag, measured and drawn by Marius Lutgerink (drawing available from Gemeentemuseum Den Haag).
3. Alto recorder (T. Stanesby) - Brüggen collection (see note 1).
4. Alto recorder (T. Stanesby jr.) - collection of Michel Piquet, measured and drawn by F. Morgan (drawing possibly available from Michel Piquet, Basel).
5. *Figurazione I & II* are my introductions to recorder-making technology. *Figurazione I* gives advice on smithwork in order to enable instrument-makers to make and work with spoonreamers, and to introduce the reader to adequate ideas concerning the metrical and technological premises of pre- and para-industrial production. Craftsmanship or free handwork and guidance of tools by abstract, metrical and functional

principles involves quite different forms of thought from those involved in today's surface-incremental copyism, which is characteristic of modern forms of metrical thought among uneducated industrial workers. *Figurazione II* contains basic experimentally-derived definitions of parameters and descriptions of operating procedures necessary for the construction of recorders and other historical woodwind instruments on functional, musical principles. Both books are in German (a Dutch translation has been made by Dirk Jacob Hamoen and JanKees Braaksma). They are available from VERLAG SUPER LIBRUM T. 050 18 85 99 THE Netherlands. They are also available in the musicological collections of the Universities of Groningen, Oslo and Trondheim.

Figurazione III (under preparation) will contain an introduction to woodwork technology and the metrics of the wooden body of recorders.

6. Martin Kirnbauer and Dieter Krickeberg, *Untersuchungen an Nürnberger Blockflöten der Zeit zeit zwischen 1650 und 1750.* Nürnberg: Anzeiger des Germanischen Nationalmuseums, 1987. Available from the museum, Postfach 9580, 8500 Nürnberg 11.

APENDIX

Editor: Dr D K Rycroft
The Galpin Society Journal
Ashdown Cottage
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November 18, 1988

Mr Sverre Kolberg
Jonas Lies vei 2D
1412 SOFIEMYR
Norway

Dear Mr Kolberg,

Your MS entitled 'A Penta-dynodical coordinate system, uncovered in the ornamental metrics of baroque recorders and traverses' has been sent on to me, together with correspondence between you and Dr Byrne, Mr Myers and Miss Holden.

As you know, we seek the advice of one or more specialists before deciding whether to accept an article for publication. However, before doing so, we expect articles to be written in clearly intelligible English. Otherwise, if there are a number of unknown words which are not in the Dictionary, and these are not even explained, it is not worthwhile wasting the time of our consultants until the author has revised his MS so that it can be clearly understood. In fact, most authors would automatically realise that it is also a waste of the editor's time to have to explain this, and would only send material which is satisfactorily written and presented.

In the title of your article, as the term '-dynodical' is not listed in standard English dictionaries, its meaning would need to be explained in your first paragraph. Also in your title, 'uncovered' is the wrong word to use; and 'ornamental metrics' is strange and not clear; and 'traverses' has a totally different meaning, in English, having no connection at all with flutes. Perhaps the term you require there is 'transverse flutes'?

Throughout the text of your article there is very frequent misuse of English, which often makes it difficult or impossible to understand what you intended to say. For example, in paragraph 1, line 3, the verb 'coincides' does not make sense there. In paragraph 2, line 4, 'metrical thought' is not acceptable; nor is 'millimetrical', in paragraph 3, line 3. If I continued to give further examples I would fill several pages.

I am therefore returning your MS, as I feel that no member of our editorial board would be prepared even to read through more than the first page of it, in its present form. However, if you wish to revise it thoroughly, with the help of a native English speaker, and to submit it again at a later date, we would certainly be prepared to reconsider it.

Yours sincerely,

D K Rycroft