The Musical Mechanisms of Arnaut de Zwolle

by JOHN LESTER

The simple harpsichord jack sliding vertically in its registers is so familiar that we tend to assume that this was the form in which it was first invented. That it had less successful precursors, none of which have survived, was something which I only discovered as a by-product of reading an article on a rather different topic by Christopher Page(l), to whom I must express my indebtedness for directing me to further sources of information.

In the Bibliothgque Nationale in Paris there is a manuscript compiled by Henri Arnaut de Zwolle(2) probably not earlier than 1440, and some two dozen leaves of this are devoted to musical matters. This section of the manuscript was reproduced in facsimile, transcription, (French) translation and commentary in 1932 by Le Cerf and Labande(3)» and the mechanisms described in this article appear as sketches with written explanations at the top of Folio 128 (recto)(Fig.l). The script is indecipherable except to the specialist and I have made my literal Ehglish translation from the transcription of the Latin given in the 1932 facsimile edition. Arnaut's dog-Latin in these descriptions while breathless in style is usually clear and yet in a few places it appears that the French editors and a later writer have at times misinterpreted it

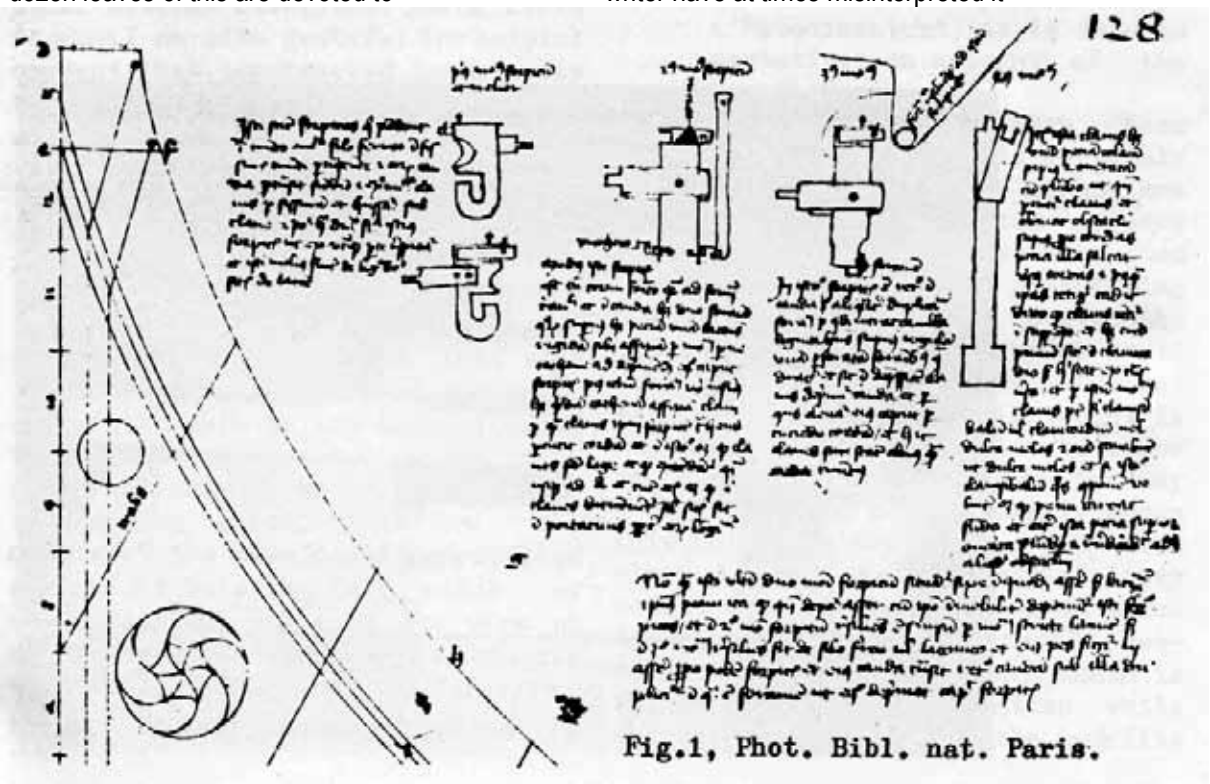

Fig.1, Phot. Bibl. nat. Paris.

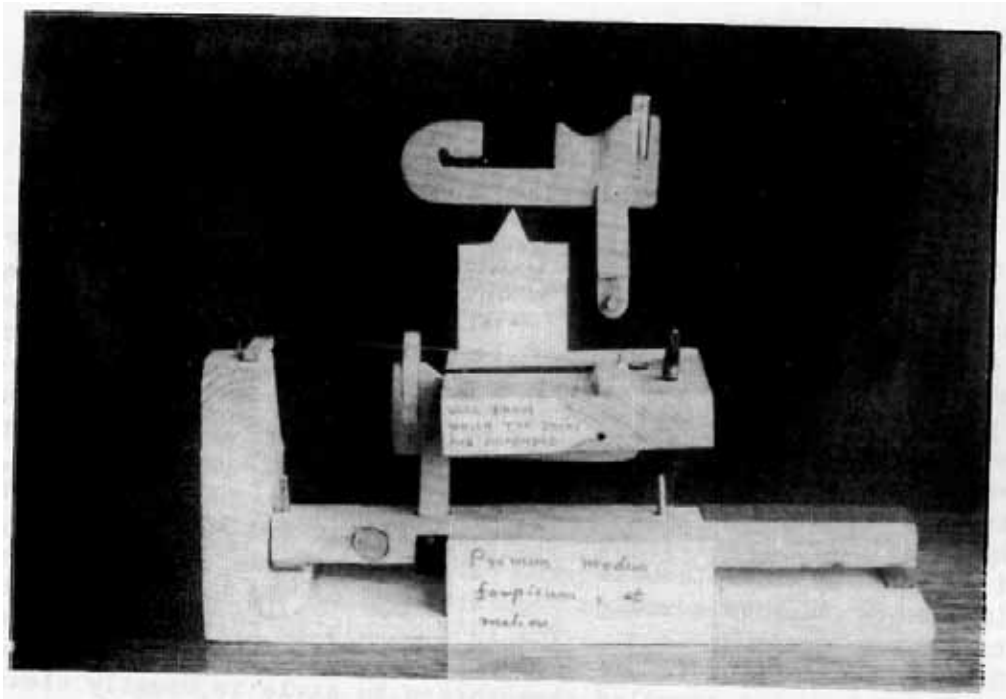

Fig. 2

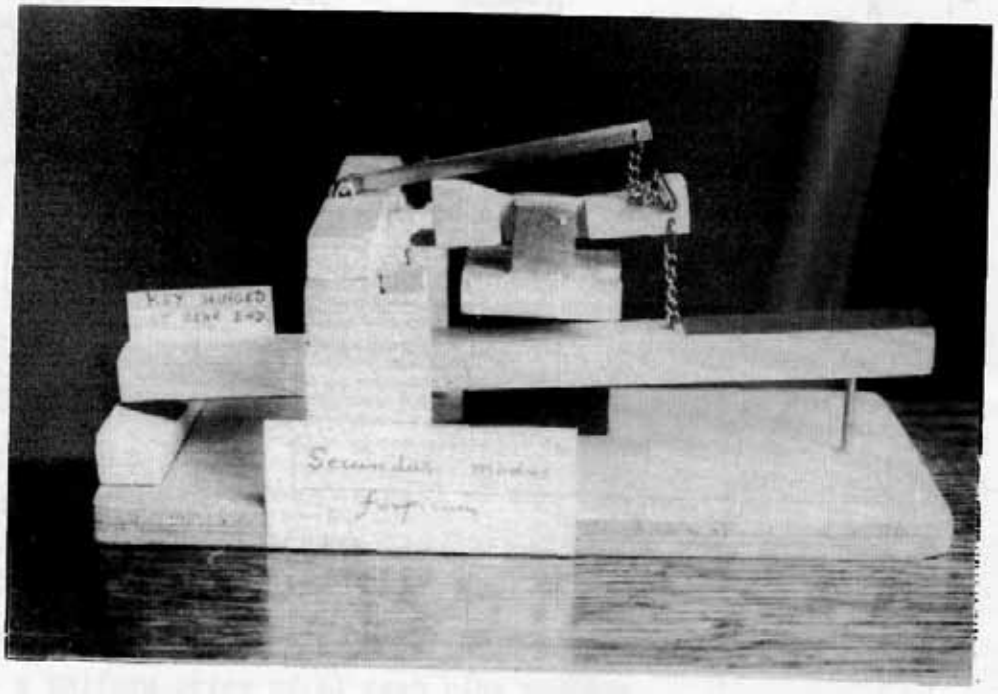

Fig. 3

Four actions are described of which I have constructed some crude one note models which are here used to illustrate the translation of Arnaut's text.

Fig.2 "The first and better type of jack. These are jacks which hang from the wrestplank by means of an iron wire penetrating the the slots in it and their tails pass through the thickness of the key by a mortise at its far end and are cross-pinned ('hus-satur[1]) underneath the key: and two views of this jack are shown so that each of the two sides can be seen and these are best made of sound wood or brass."

It is clear from the sketch that the pivoted tongue presumably with bristle spring has already been invented though Arnaut does not refer to it in his text. No provision was made for damping in this or any of the other actions described. Lewis Jones to whom 1 am also grateful for helpful comment, has constructed instruments based on the first and fourth of Arnaut's actions and considers(5)that this omission would not have offended the XV century ear accustomed to the sound of psaltery and dulcimer. The rounded hollow in the back of the jack was either made to provide clearance from the edge of the slot in the wrestplank or perhaps it wore into that shape. Cluttpn(4) sketches the mechanism with this hollow well clear of the edge of the wrestplank but this seems unlikely to be correct. It is interesting to conjecture how the makers of the time could have drilled a straight hole the full width of the wrestplank to take the wire on which the jacks were hung. Certainly this action lives up to its descript -

ion of "Primus modus forpicum et melior" and it is perhaps not surprising that a somewhat similar pivoting jack has been re-invented in this century for use in an upright harpsichord(6).

Pig.3 "The second type of jack. This type of jack is shaped with a point like a triangle and in the tail has two holes of which the upper one is connected to a rigid piece of brass by means of a little chain for depressing the head of the jaek after the stroke. The lower hole has a chain fixed to the key by which the key pulling the selfsame jack strikes ('percutit') the string; and in this type it is necessary that the keys are long and stretch as far as 'A[1] (the level of the far end of the treble cheek of the instrument), and then it is necessary that at that end the keys are tarred ('Bituminentur') as is done in portatives on account of the length."

Heath-Robinson would have been proud of this one. It is certainly the least easy of the four mechanisms to understand. The French editors speak of an escapement action but then contradict themselved by postulating the existence of a damper to stop the noise of the returning plectrum as it touches the string. They further suggest that the triangular point is flatter on the top than below to allow it to escape more easily on the way down whereas the sketch clearly shows this not to be the case. They even claim to have made a satisfactory model. Glutton draws a diagram which departs entirely from Arnaut's description in that the lower chain is attached to a separate batten while the supporting pillar of the jack fits

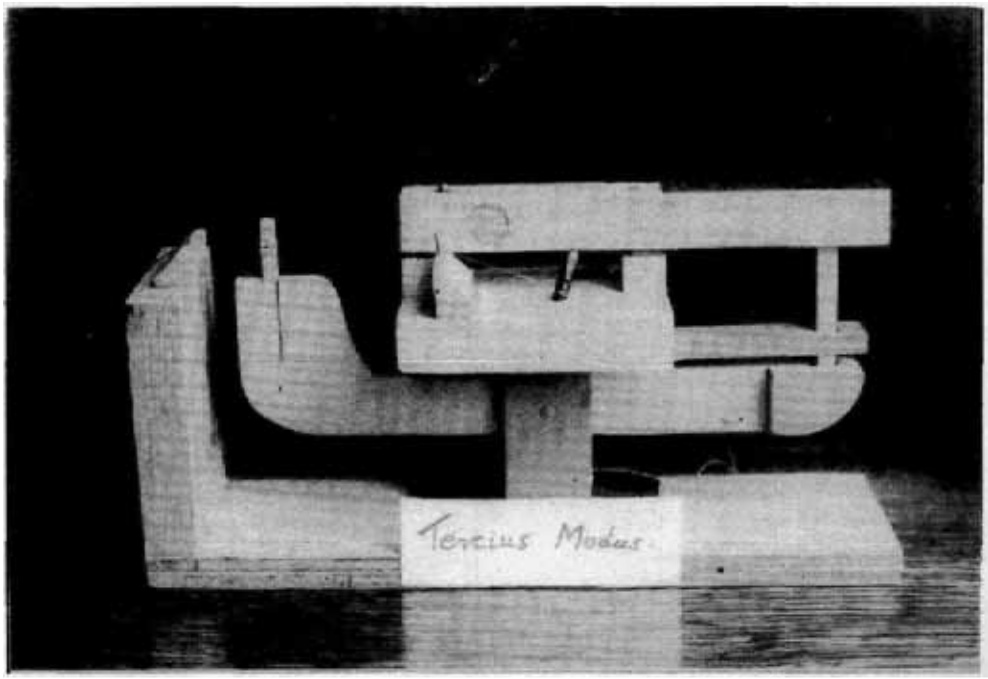

Fig. 4

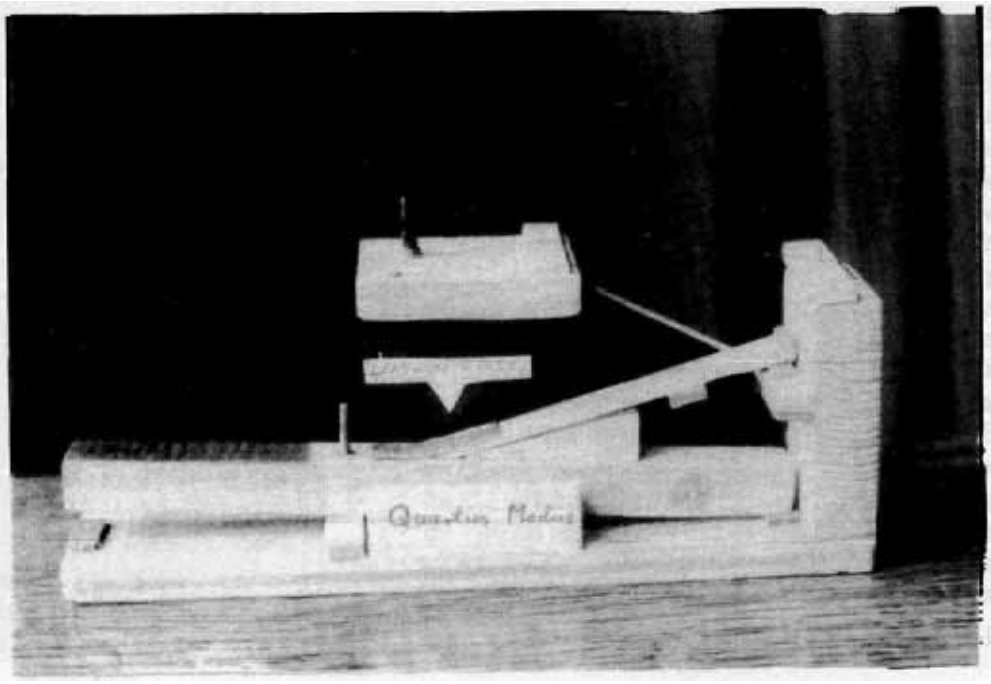

Fig. 5

into a hole in the key. While this is incorrect it looks more likely to work than does Arnaut'0 version.

An ingenious explanation was given to me by John Logan(7) who suggests that the action is a percussive rather than a plucking one, and this would remove the necessity for imagining an escapement action allowing the plectrum to re-pass the string without touching it. It still does not explain why the point is triangular nor does it answer a more serious objection. The string in this action is lying transversely and the only method of building an instrument in such a way that the jacks did not all act on the same string would be in the form of an upright harpsichord with transverse strings and the jacks,tethered by ever longer chains, mounted on a sloping batten. Lewis Jones is of the opinion that Arnaut was describing something he had been told about but never seen and had misunderstood what he had been told. He has produced his own explanation of what the original mechanism might have been(8).

The reason for the keys being long is that this is a second-order lever and the explanation for their being "tarred as is done in portatives" is supplied by Michael Thomas (9) who interprets the phrase to mean that the keys are pivoted at the back by hinges glued with bitumen.

Fig.4 "Third type. In this type of jack there is in the tail at the back where it is partly doubled, a hole through which enters a wooden peg having above it a lath perforated with square holes and so by depression of the key the tail is depressed and as a result the head becomes raised striking the string, and here the keys are above the wrestplank.'[1]

There are few difficulties in understanding this mechanism employing something resembling the tracker action of an organ. Le Cerf & Labande suggest that the lath with square holes is a device to regulate the key dip but this would be impossibly crude. Surely the obvious explanation is that this lath is simply a guide for the pegs connection the keys to the pivoted jacks below. Later in the manuscript reference is made to a wire spring which helps to raise the rear of the jack after the key has been released. This action is unsatisfactory because any sideways play at the pivot is greatly magnified at the plectrum causing an unacceptable irregularity of plucking.

Fig.5 "Fourth type. This key ha* * member glued on top and weighted with lead so that when the key is struck and encounters a buffer overhead and near to the strings and after it has touched them returns although the key is kept depressed, and it has a tangent like a clavichord but this lies transversely and by this method the key can become a clavisimbalum or clavichord or dulce melos and all will sound like a dulce melos and if anyone should wish to construct this type of clavisimbalum it is necessary that the action should avoid being deep; and the upper member will be weighted with lead and will recoil against a stop."

This is perhaps the most interesting of all the actions Arnaut described. Although he does not mention it specifically, it is clear from the description that the member must be hinged to the key so that it can move independently. Thin leather or parchment

may have been used. "Onnepeut mieux decrire le systeme de percussion qui caracterise le pianoforte" say the 1932 editors, and if only this action had been developed it would have altered the entire history of keyboard music. Perhaps we should be grateful that nearly two centuries were to elapse before Cristofori re-invented an action with a recoiling hammer. Strangely, Clutton in his 1952 article departs entirely from the sense of the manuscript, imagining a free piston-like weighted rod striking the string and he mentions that Galpin made an instrument on this principle.

Arnaut[1]s references to clavisi-mbalum, clavichord, or dulce melos are confusing unless one assumes that he is using these terms to describe the shape of the instrument rather than its action. He would on this system describe to-day a clavichord, a virginals, and a square piano by a common term although they all have a different method of operation.

For completeness some further quotations from the manuscript which hark back to the four mechanisms described should be included. In the first 1 believe Arnaut is referring to mechanisms two and three since he does not use the word jack (Forpex) to describe the fourth one.

(i) "Note that these last two types of jacks are placed immovably in a certain batten corresponding with the width of the action and when the bat tea is removed the jacks fixed to it are removed, and in the second type of jack the return spring is above by means of a short blade but in the third kind the spring is made of iron or brass wire and the foot of it is attached to the batten near the base of the jack and the tail of it passes behind the tail beneath the doubled part in which there is a hole so that it depresses the head of the jack."

Here a spring is described as part of the 2nd mechanism though the sketch suggests that the upper part of the action consists of a pivoted blade of brass acting by its weight rather than its elastic properties.

(ii) "...and above this level there is to be made a rectangular box of which the front part comes down between the strings and the back part down to the semitone keys."

This enclosure of the first action described would serve to keep out dust and prying fingers and at the same time diminish mechanical noise.

(iii) "It is also possible to make a double-strung one and then it is not necessary that a piece of iron or brass wire shall be placed on the nut, but where the wire passes there must be placed little pegs of iron or brass having two projections one above the other by means of which the strings can be positioned one above the other."

This is interesting in that it pro* poses an arrangement which so far as I know has not been used in a classical harpsichord, i.e. that the jack shall move up twice as far and pluck two strings, one above the other. This would clearly only be possible in an instrument without dampers.

Describing the construction of the dulce melos Arnaut says it can be made in three ways.

(iv) "First in a common and crude fashion ... simply by means of a rod hitting the strings in a

rather bucolic fashion."

This may be the instrument which Glutton tells us was made by Galpin but it is surely not what is illustrated and described by Arnaut as his Fourth type. (The other two ways are "like a clavichord" and the Fourth type already described).

There is much in this manuscript to interest and puzzle those curious enough to read it. I hope that this article may encourage others to seek it out since it describes a time of considerable experiment and ingenuity which is otherwise undocumented. The fact that the information does not always come through unambiguously adds to its attractions and heightens con* jecture about the real nature of keyboard instruments of the period.

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