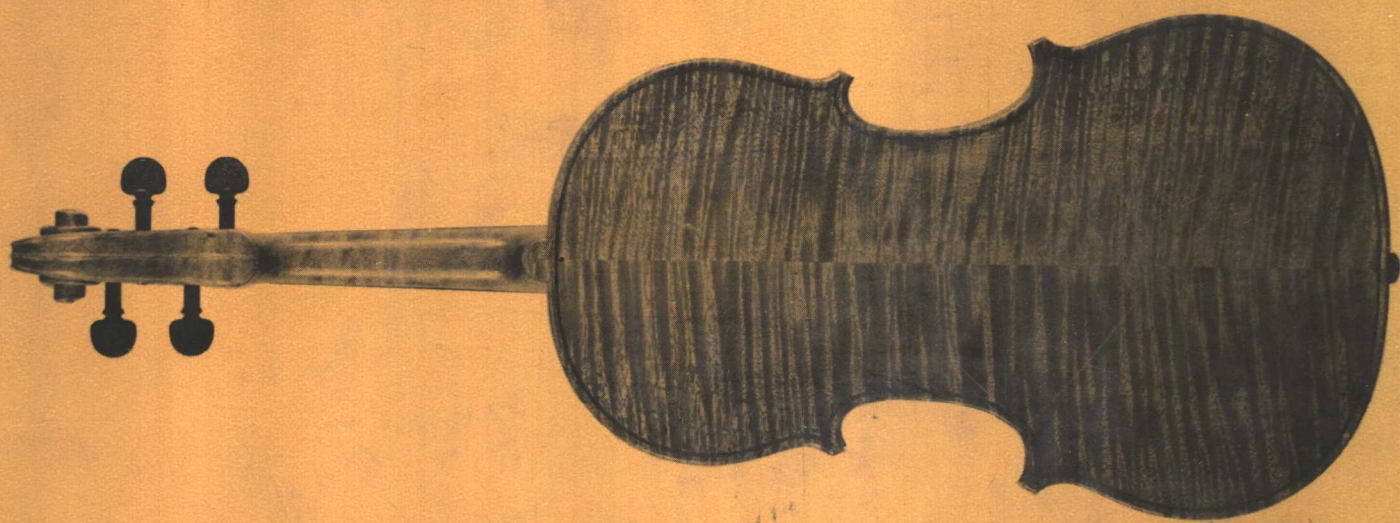


中央音乐学院图书馆藏

书号

总记登号

121536



**MAKING** *EDITED BY*  
**MUSICAL** *Charles*  
**INSTRUMENTS** *Ford*  
*Strings & Keyboard*

Making Mus

## *Making Musical Instruments*



*Making Musical  
Instruments  
Strings and Keyboard*

*Edited by*  
CHARLES FORD  
*with a Foreword by*  
ANTHONY BAINES

*Faber & Faber*  
LONDON AND  
BOSTON





*First published in 1979  
by Faber and Faber Limited  
3 Queen Square London WC1  
Printed in Great Britain by  
Latimer Trend & Company Ltd Plymouth  
All rights reserved*

© *This collection 1979 by Charles Ford*

British Library Cataloguing in Publication Data  
Making musical instruments, strings and keyboard

1. Stringed instruments—Construction

I. Ford, Charles

787 ML 755

ISBN 0-571-10870-9



# Contents

*Foreword by Anthony Baines* p. 11  
*Editor's Preface by Charles Ford* p. 13

## 1 *The Viol*

DIETRICH KESSLER  
p. 15

## 2 *The Lute*

IAN HARWOOD  
p. 37

## 3 *The Violin*

*including the Baroque Violin*

ADAM PAUL  
p. 69

## 4 *The Classical Guitar*

JOSÉ ROMANILLOS  
p. 101

## 5 *The Harpsichord*

MICHAEL JOHNSON  
p. 131

## 6 *Restoration and Conservation of Historical Musical Instruments*

FRIEDEMANN HELLWIG  
p. 155

*About the Contributors* p. 177

*Bibliographies* p. 179

*Index* p. 189





# Illustrations

## *Plates*

### BETWEEN PAGES 176 AND 177

- I Baroque seven-string bass viol by Dietrich Kessler after Richard Meares
- II Inside view of the large octave bass lute by Michielle Harton, Padua 1602
- III Eight-course lute by Charles Ford after Harton
- IV Viola by Adam Paul
- V Cross-sections of a modern and a Baroque violin, illustrating the differing construction details
- VI Guitar by José Romanillos based on a design by Hermann Hauser sen.
- VII Front and reverse sides of the head
- VIII Harpsichord by Michael Johnson after Taskin
- IX The harpsichord and its keyboard before assembly
- X Plan view of a harpsichord by Giovanni Battista Giusti, Lucca 1681
- XI A radiograph of the instrument showing details of the interior
- XII Technical drawing of the harpsichord by G. B. Giusti. Details taken from radiographs, the instrument was not opened
- XIII Two details of a harpsichord soundboard, one showing where bars from a recent restoration have been removed and the other where the glue marks left by the original barring have been made visible by the fluorescence from ultra-violet radiation

## *Line drawings*

### I *The Viol*

- |   |    |   |    |
|---|----|---|----|
| 1 A simple gas-heated bending iron                        | 16 | 6 Soundpost-setter  | 17 |
| 2 Purfling tool and cutter assembly                       | 16 | 7 Mould for a viol, with cramping blocks and cramping jig | 20 |
| 3 Wooden cramp used for assembling belly and back to ribs | 17 | 8 Plan and cross-section of a viol                        | 21 |
| 4 Thicknessing callipers                                  | 17 | 9 Belly thicknessing, two different methods               | 28 |
| 5 Peghole reamer and peg cutter                           | 17 |   |    |

### 2 *The Lute*

- |   |    |  |    |
|---|----|--|----|
| 1 Geometrical construction for a lute outline | 39 | 2 True shape of the rib and its derivation | 40 |
|---|----|--|----|

## *Illustrations*

3 Construction of the solid former	42	10 Rose pattern, a basic geometric design	53
4 Construction of the mould	42	11 Soundboard-to-rib assembly	55
5 Neck-body joint	43	12 Fingerboard and soundboard overlap	57
6 Capping strip or end-clasp	47	13 A typical bridge design, c. 1600	58
7 Pegbox design for a seven-course lute	49	14 Tying double and single frets for lutes and viols	65
8 Pegbox-to-neck joints: simple butt joint, and rebate joint	50		
9 Marking out the soundboard	52		

### *3 The Violin*

1 The violin design	70	assembly; plan of the back button; and the neck-body mortise plan	90
2 Cross-section detail	72		
3 Form or mould and cramping jig	74	8 (a) Modern violin cross-sections and details	94
4 Thicknessing the back and belly	80	(b) Baroque violin cross-sections and details	95
5 Back and belly outlines	82		
6 Bass-bar design and placement	84		
7 Cross-section of neck-to-body			

### *4 The Classical Guitar*

1 Soundboard and barring layout	104	7 Plan and cross-section of the head	118
2 Cramping jig for fan struts and transverse bars	106	8 Cross-section of the assembled body	122
3 Plan and cross-section of neck, heel, and foot	108	9 Cross-section of bridge and saddle	123
4 Back and bar positions	110	10 Plan and side elevation of the bridge	124
5 Neck and soundboard-to-baseboard holding device	113	11 Cramping device for gluing and holding the rosette	128
6 Neck-head splice-joint	116		

### *5 The Harpsichord*

1 Laminated bentside former, constructed from three or more boards	134	5 Cross-section of arcade cutter bit	147
2 Keyboard- and action-design for a French double-manual harpsichord	136	6 Plan, cross-section and end elevation of a key lever	148
3 A simple circle cutter	142	7 Tool for punching plectra holes	149
4 Eye-twisting tool	145	8 Four-foot and eight-foot jacks	151

### *6 Restoration & Conservation*

1 Cross-section of a tree showing how cut lumber is likely to be affected by shrinkage according to its position within the tree's annual growth rings	157	2 Typical cross-section of a woodwind instrument showing how the tube may be cracked as a result of moisture from playing	158
--	-----	---	-----

# Foreword

ANTHONY BAINES

I feel it an immense honour to be given the opportunity of introducing this most necessary book. There will probably always be some room among people who take an interest in instruments for those, like myself, who are purely executants and historians. But times have changed, and we all now recognize the supreme importance of those others who are, in addition to these two things, instrument makers also. To one who has witnessed it over recent years, this widening of attitudes appears as an astonishing revolution. One looks back across the long years through which, in the field of revival of ancient instruments, the Dolmetsch family operated in this country virtually as lone wolves. For us, they began it all. Then, after the last war, new artist-craftsmen appeared on the scene, led by two distinguished contributors to the present volume, Dietrich Kessler and, later, Ian Harwood. Yet it still took a few more years for the great 'psychological barrier' to be generally removed: namely that the skills of actually making a successful instrument do not, after all, necessarily have to be handed down from father to son, from foreman to apprentice, as trained artisans after the ways of the last century – men who were somewhat patronized in a jovial manner by the better-paid musicians, celebrated or rank-and-file, who appeared before the public.

True, there were always men like Heron-Allen – how many hundreds of amateur fiddle-makers must have profited from his book<sup>1</sup> – but they were exceptions to what was generally expected. Today, and one records the fact with genuine excitement,

people who feel the urge come upon them, often young people with no more previous training than perhaps a little woodwork at school, simply plunge in, quickly to produce some passable work and confident of eventually producing very good work and announcing a waiting list. How few would have contemplated – one could say, dared – even to embark on the first stage fifty years ago?

Best it is, of course, when the novice maker, perhaps one who wishes to go beyond 'kits', has the advantage of guidance by a craftsman already experienced, successful and enterprising (meaning in particular by the last, having a thoughtful interest in history). Failing this guidance, published manuals are needed, and within these covers there are a whole series of them, each by an acknowledged expert in his field – whereby the chapters will prove no less valuable to makers who have already had some experience. No one need doubt the worth of following instructions in print. In our workshop here a young friend who had barely touched a lathe before has just completed a beautiful set of small-pipes in boxwood, working wholly from Cocks and Bryan.<sup>2</sup> All who open this book will no doubt immediately think of similar examples of personal enterprise, probably led by himself or herself, but has it *always* been possible to back the enterprise with a comparable set of expert instructions? I know that this cannot have been so. So now please find your chapter and read on.

A.B.

Oxford, 1978

1. E. Heron-Allen, *Violin-making as it was and is*, London, 1884, etc.

2. W. A. Cocks & J. F. Bryan, *The Northumberland Bagpipes*, Newcastle upon Tyne, 1967.



## *Editor's Preface*

CHARLES FORD

Making musical instruments is a most satisfying art and, as a reaction to our mechanical age perhaps, many people are eager to learn once more the old skills which gave hand-made instruments their special value. This book is intended to guide and encourage those who want to make their own instruments; professional as well as non-professional makers will find much useful information here, for when experts talk or write on their subject even the learned may learn something new. The final chapter in this book, on the conservation of musical instruments, should also be of great interest to makers and restorers alike, for the value of existing historical instruments and their careful preservation and restoration is now fully appreciated. Our attitude towards the making of new instruments or reproductions of historic instruments, and the methods of construction, must be flexible, for an instrument's personality is surely determined largely by the maker's own style and methods of construction. The contributors to this symposium describe how they themselves make musical instruments, and for this they have assumed that the reader already has a basic knowledge of woodworking and of the use and handling of tools, which is a subject in itself. Those who are encouraged to make one of the instruments described here will benefit enormously from the experience and, by closely following the experts' advice, will learn a great deal; and producing the first instrument usually results in a life-long involvement!

The instruments featured in our book, viol, lute, violin, guitar, and harpsichord, have

been chosen because they seem to represent the most popular string and keyboard instruments. Neither wind nor percussion instruments have been included as it was felt that the very different construction principles and techniques, and the vastness of those subjects, would fill another book. String and keyboard instruments can be made with surprisingly few tools and, with ingenuity, one can do without many of the 'special' tools used by professional makers. Well-seasoned timbers, so essential to the instrument maker, such as spruce, ebony, rosewood, and so on, are becoming increasingly difficult to find; however, there are various sources and some of these can be found advertised in the pages of magazines concerned with music and musical instruments. Many museums now have available scale drawings of the instruments in their collections and these, and the study of the instruments themselves, provide unique information for those who are concerned with making historically accurate instruments.

It remains for me to thank my colleagues who have contributed these chapters and who have co-operated over the long period of this book's preparation. For generous help given throughout this period, my sincere thanks to Dr Anthony Baines, Professor Robert Donington, Mr David Godden, Mr Friedemann Hellwig, Miss Judith Osborne, Mrs Diana Poulton, Mr José Romanillos, Mr Howard Schott, Mr John Thomson, Mrs Keith Witt, and Dr Berthold Wolpe. For the design of the book, my thanks to Shirley and Michael Tucker.

C.F.

*London, 1978*





I

*The Viol*

DIETRICH KESSLER

## *1. Introduction*

It is very nearly thirty years since I started making my first viol; it was a vastly different looking – and sounding – instrument from the ones being made now, some hundred-and-sixty viols later. With every one of these I have tried to achieve as good a result as possible, both tonally and from a workmanship point of view, but because one's own taste and ideals change, the latest viols are bound to be different from the earlier ones. This process of experimenting and – hopefully – improving is something that is bound to go on. The most that can be claimed for this chapter, therefore, is that it is a faithful record of how I feel viols should be made at the moment.

• I have never been of the opinion that, simply because an instrument is old, it is bound to be good; there were good and bad makers, then as now. Over the years I have adopted more and more of the ideas of seventeenth-century English makers, but this approach had to be selective, as I have never been interested in making copies for museums, only real instruments for musicians. In selecting certain features as worth copying and rejecting others, I have tried to learn from both their successes and their failures. Future generations of players will have to decide if I have made the right decisions.

This chapter describes how the bass viol illustrated here was made. I have assumed that any reader who intends to make a viol has had some previous experience, if not in instrument-making, then at least in fine woodwork. For those who would like more detailed guidance of a practical nature, the book by E. Heron-Allen, *Violin-making as it was and is* (London, 1885), should provide most of the answers. For more information on design and proportions of viols, their sizes and tunings and a lot of other background material, Nicholas Bessaraboff's book, *Ancient European Musical Instruments* (Boston, 1941), cannot be too highly recommended. Many of the processes described in this chapter sound complicated and difficult, but I hope no potential maker is put off by this; I, for one, find making a viol much easier than writing about it.

## *2. Tools and Materials*

There are only a few special tools required for making a viol over and above the ones a cabinet-maker uses. I am only going to list the most important of these; anybody seriously interested in making viols will soon find out which others can be helpful and save time.

One of the most obvious is a bending iron, which is basically a piece of metal tubing, approximately 4 cm in diameter and some 15 cm long which is heated through the centre

## *Making Musical Instruments*

by a gas flame, and which can be made easily. More elaborate ones are available – usually from Germany – in which the heating is done by electricity and the temperature is controlled by thermostats.

A set of three or four small violin-maker's planes is important. It is very difficult to make an arching, or to thickness a belly without them, and once one has got used to handling them, any number of other jobs can be done with them more quickly than by conventional methods.

Purfling tools exist in various designs, although the idea behind them is always the same. The gaps between the two cutters and between the cutters and the guide must be fully adjustable. The type illustrated is superior to other types if one wants to inlay purfling ornaments: the cutter assembly can be removed from the rest and used without the handle and guide.

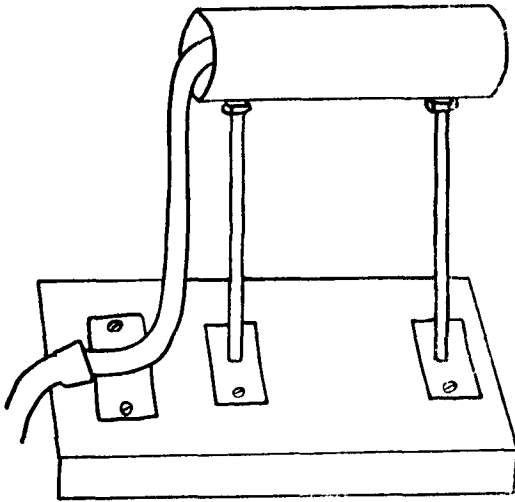


Fig. 1.1 *A simple gas-heated bending iron*

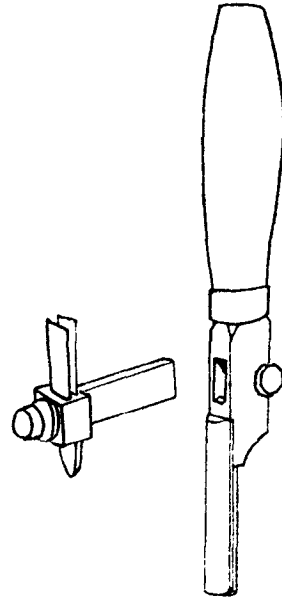


Fig. 1.2 *Purfling tool and cutter assembly*

For gluing backs and bellies most instrument-makers use cramps similar to the one illustrated. This (Fig. 3) is made entirely from wood but sometimes spindle and thread are of metal, and, depending on the size of the discs and of the viol, between thirty and forty cramps are needed to go round a bass viol. To apply the pressure evenly they are best placed close together without any gaps in between.

About the most important tool for a maker is his knife. It is usual to buy the blade and make the wooden handle to fit your hand. The three most useful blade widths are 6, 15 and 20 mm. The latter two are for all purposes, whereas the narrow blade is for cutting soundholes and bridges.

Apart from a big cabinet-maker's scraper (approximately 15 × 7 cm) it is a good idea to have one or two smaller ones made from spring steel 0.4 to 0.5 mm thick. These should be so shaped that concave surfaces can be scraped, such as the inside of a belly for example. These thin scrapers should be ground from one side at 45° all round, and honed until perfectly sharp, when with the help of a scraper steel the edge should be pushed over towards the flat side to form the burr.