

no reason to believe that the bore was intended to be otherwise than cylindrical. Although keys appear to have been common on all other wind-instruments, during this century and a half, we have no direct evidence that they were then applied to flutes, though we may infer that certain large flutes mentioned by Mersenne were furnished with them, as otherwise it would have been impossible for the fingers to have covered the holes. There is, however, no proof that the flute was made with more than six finger-holes prior to the year 1660, either for the purpose of increasing its compass, or for the alteration of its original diatonic character, a defect much lamented by Mersenne.

410. Notwithstanding the rude construction of the early flutes and their extremely limited capabilities, the unrivalled charm of the tone peculiar to the instrument must always have been present in some degree, and to this great point of excellence, combined with the power of the skilful player to rectify imperfect notes, we may consider that the flute owed its popularity for so many years. It is not improbable that owing to the power above mentioned, the early flute, though actually one of the most imperfect of wind-instruments in construction, was more perfect in performance than any of its contemporaries.

411. There is no evidence, of which I have any knowledge, that the transverse flute was known in England at the period of which this chapter treats, we may therefore hope that William Prynne's denunciation of flute-players in 1633 was intended for the professors of the "English flute" or *flûte-à-bec*. "If," said that most intolerant divine, in his *Histrion Mastix*, "a stage player, be it a man or a woman, a charioteer, gladiator, race runner, a fencer, a practiser of Olympian games, a flute-player, a fiddler, a harper, a dancer, an alehouse keeper, come to turn Christian, either let him give over these professions, or else be rejected."

CHAPTER XIV.

THE HISTORY OF THE FLUTE FROM 1660 TO 1827.

§412. THE APPLICATION OF KEYS, 1660 *CIRCA*.—414. THE DIMINUTION OF THE FINGER-HOLES.—415. THE CONOIDAL BORE, 1680 *CIRCA*.—416. THE HOTTETERRES.—418. *TABLE OF THE FINGERING OF THE ONE-EYED FLUTE*, 1699.—422. FILIPPO BONANNI, 1722.—423. THE "c' AND c'♯ KEYS."—424. A FLUTE BY F. BOIE, 1724 *ANTE*.—430. A FLUTE BY BIGLIONI, 1725, *ANTE*.—434. THE FLUTE OF QUANTZ, 1726.—435. QUANTZ'S FINGERING.—439. GERHARD HOFFMANN.—440. "THE MODERN MUSICK-MASTER," 1730.—441. AN EARLY "BASS FLUTE."—443. A "BASS FLUTE" IN g, 1751 *ANTE*.—445. THE ESSAY OF QUANTZ, 1752.—446. A FLUTE BY T. LOT, 1756 *CIRCA*.—449. SCALE OF FINGERING IN THE FRENCH ENCYCLOPÆDIA, 1756.—450. A "BASS FLUTE" BY DELUSSE, 1760 *CIRCA*.—451. THE "EXTRA KEYS" FOR f, g♯ AND bb, 1774.—454. REVIVAL OF THE "LOW c AND c'♯ KEYS."—455. THE c' KEY.—457. THE FLUTE AS DESCRIBED BY LAMBERT, 1775.—464. THE STATE OF FLUTE-PLAYING IN ENGLAND IN 1776.—465. AN INSTRUCTION-BOOK BY ANTONIO LORENZONI, 1779.—466. DR. RIBOCK'S "BEMERKUNGEN," 1782.—471. THE FLUTES OF TROMLITZ, 1783.—473. RICHARD POTTER'S PATENTS, 1785.—474. THE FIRST WORK OF TROMLITZ, 1786. THE "LONG f KEY."—477. INSTRUCTIONS FOR THE FLUTE OF FLORIO AND TACET, 1789 *CIRCA*; WRAGG'S FLUTE PRECEPTOR, 1790 *CIRCA*.—478. THE SECOND WORK OF TROMLITZ, 1791.—479. JOHN GUNN'S "ART OF PLAYING THE GERMAN FLUTE," 1793.—480. *MÉTHODE* BY F. DEVIENNE, 1795.—481. THE THIRD WORK OF TROMLITZ, 1800.—487. *MÉTHODE* OF HUGOT AND WUNDERLICH, 1801.—488. ATTEMPT TO REMODEL THE FLUTE BY WM. CLOSE, 1802.—489. POTTGIESSER'S FIRST EFFORT TO IMPROVE THE FLUTE, 1803.—499. LAURENT'S GLASS FLUTES: "THE LONG c' KEY," 1806.—500. A FLUTE BY MONZANI, 1807.—503. DR. J. H. LIEBESKIND,

1806-7-8.—504. W. H. POTTER'S SLIDING KEYS, 1808.—505. TOWNLEY'S TUNING LEVER, 1808.—506. TOWNLEY'S *d'* KEY, 1808.—507. TOWNLEY'S MOUTH-PIECE, 1808.—508. NOLAN'S "OPEN *g*[♯] KEY," 1808.—512. SCOTT'S PATENT, 1810.—513. MACGREGOR'S "BASS FLUTE," 1810.—517. MILLER'S METAL FLUTES, 1810.—518. FLUTE BY W. H. POTTER, 1810 *CIRCA*.—520. RE-ENLARGEMENT OF THE FINGER-HOLES.—521. WEBER'S ACCOUNT OF A NEW FLUTE, 1811.—525. MONZANI'S PATENT, 1812.—527. WOOD'S PATENT, 1814.—528. FLUTES FOR ONE-HANDED PERSONS, 1815 *CIRCA*.—530. WALKING-STICK-FLUTES.—531. EIGHT-KEYED FLUTE BY DROUET, 1818 *CIRCA*.—532. "FLÔTES D'AMOUR," BY CLEMENTI, 1819, AND OBERLENDER.—534. WHEATSTONE'S MOUTH-PIECE, 1820.—535. RUDALL AND ROSE.—536. C. NICHOLSON'S FLUTES, 1822.—541. PETERSEN'S FLUTE.—542. POTTGIESSER'S SECOND EFFORT, 1824.—547. PLEASING EPISODE.—548. THE FLUTE IN 1826-7.—554. FINGERING OF THE "EIGHT-KEYED FLUTE."—559. KEYS OCCASIONALLY ADDED.—560. LIST OF INSTRUCTION-BOOKS.

412. The Application of Keys, 1660 *circa*. It is clearly established, by numerous old engravings, that keys were first applied to instruments with reeds or mouth-pieces for the purpose of enabling the performers' fingers to reach the holes of the larger instruments, or for the sake of extension of the compass of both large and small in a downward direction: these were of necessity open keys. The smaller whistles (or, as they were once called, flutes,) did not require such keys, but they were commonly provided with two holes which were closed, together or separately, directly by the little finger of the right hand. The first keys of the transverse flute were no doubt applied with the same objects as were those of other wind-instruments, therefore they also were open keys. These were not by any means common appendages of the early flute, and they do not appear to have been held in very high estimation, for it is evident that they went almost, if not quite, out of use for many years, notwithstanding the frequent efforts that were made to bring them into favour.

413. The first really great improvement effected in the flute was

the addition of a new finger-hole, giving *d*[♯], which was covered by a closed key governed by the little finger of the right hand. Quantz (1752) writes: "The transverse flute was not always as it is now. As the key necessary for the production of *d*[♯] was wanting, one could not play in all the keys. I myself have a flute of this kind, which was made in Germany about sixty years since, and which is a fourth lower than the ordinary flute. The French were the first to render the instrument more useful by the addition of the *d*[♯] key, which the Germans had not previously possessed. Notwithstanding all the pains that I have taken, I have been unable to discover either the exact date of this invention or the name of the inventor, but there is no doubt that the improvement was effected in France: probably less than a century ago. . . . The first in France to distinguish himself, and to gain popular admiration by his performance on the improved instrument, was the renowned Philibert, [or Philbert] the hero of so many singular adventures. After him came La Barre and Hotteterre '*le Romain*.' Then followed Buffardin and Blavet, who achieved still more than their predecessors."

Michel de Labarre, according to Fétis (1865), was born in Paris in the year 1675, about thirty years after "Hotteterre *le Romain*," and died there in 1743. Very little is known concerning him. Biographical notices of Hotteterre, Buffardin and Blavet will be found in part IV. of this work.

Quantz continues: "The French were the first to do justice, by their performance, to the qualities of the instrument: the Germans received it from them in its improved form, that is to say with one key, about fifty or sixty years since. The special predilection that the Germans have always had for wind-instruments has caused the transverse flute to be now as popular in Germany as it is in France."

The name of the inventor of the *d*[♯] key is still as uncertain as it was in the days of Quantz, but all the information at our disposal tends to show that the improvement was made about the year 1660, though it is impossible to fix the date precisely.

Representations of early one-keyed flutes are given in §416, *fig. 43*, and §426, *fig. 44*.

414. The Diminution of the Finger-holes. The important discovery of the $d\sharp$ key paved the way for subsequent steps towards the perfecting of the flute by raising it, in some degree, above the level of the mere diatonic instrument that it had previously been, and the requirements of advancing musical art no doubt gave rise to an increased desire on the part of flute-players for the further development of their already charming instrument. The large holes of the time of Mersenne must have created serious difficulties with regard to the fork-fingerings, and, taking these things into consideration, we may assume that the holes were reduced in size for the purpose of improving the notes given by the fork-fingerings, and that the diminution was made at about the same time as the introduction of the $d\sharp$ key. The sacrifice, in respect of power of tone, which was caused by the change, was evidently accepted for the sake of the increased capabilities, in other respects, that were gained.

415. The Conoidal Bore, 1680 *circa*. In §339 allusion was made to the conoidal contraction of the lower part of the bore; to the doubtful origin of the change, and to the advantages afforded by it. Whoever may have been the originator of this improvement in the transverse flute, we cannot be very far wrong in computing that it was made about twenty years after the $d\sharp$ key was introduced, that is, about the year 1680.

M. Lavoix (1878), states that the conoidal bore was invented in 1762 by a wind-instrument maker of London, named Kusder. It does not appear that there is any ground whatever for this assertion, as will presently be seen, although there is proof that a wind-instrument maker of that name did reside in London, for in the valuable and interesting collection of musical instruments belonging to Mr. Carli Zoeller, there are two hautbois made by Kusder, which are lying before me as I write. These are both branded "KUSDER, LONDON."

416. The Hotteterres. At the latter part of the seventeenth century, and the beginning of the eighteenth, the flute was

exceedingly popular on the Continent, especially in France. The celebrated family of the Hotteterres contributed largely towards this result. Henri Hotteterre had been established in Paris as a wind-instrument maker since 1650, and he was considered one of the best manufacturers of his time. His third son, Louis, surnamed *Le Romain* on account of his having resided in Rome, was a renowned flute-player. At a period not later than 1699 Louis Hotteterre published an admirable little book entitled, *Principes de la Flûte traversière, ou Flûte d'Allemagne; de la Flûte à bec, ou Flûte douce, et du Hautbois; divisé par Traitez* (1699). The book bears no date, but Fétis shows that its title appeared in a catalogue of musical works published in that year; a matter of no small historical importance, for not only was this the first complete book of instructions published for the flute, but it contains two engravings of conoidal flutes, and, its date being thus established, it affords incontestible proof that such instruments were at all events manufactured before the end of the seventeenth century.

The wood-cut below is a copy of one of the above-mentioned engravings.

FIG. 43.



417. Louis Hotteterre says in his preface: "As the transverse flute is one of the most agreeable and fashionable of instruments, I have considered it a duty to undertake this little work in order to aid those whose inclinations might lead them to aspire to become flute-players." Then follow nine chapters of excellent instructions, including tables of fingering, with rules for sounding each note of the scale in the manner best adapted for it. As these are the first tables of fingering for the one-keyed flute, known to have been printed, the scale for the ordinary notes is here reproduced, somewhat modified, however, in the arrangement for the sake of brevity.

418. Table of the Fingering of the One-keyed Flute, by Louis Hotteterre (1699).

1L
2L
3L
1R
2R
3R
Key.

The c^\sharp is directed to be fingered in the same manner as the d' , and to be flattened down to c^\sharp by turning the flute inwards.

419. An analysis of some of the above fingerings will be instructive and, it may be hoped, interesting. The evil qualities of the "fork f^\sharp " have been explained in §§374 and 375: it will be readily seen that the e' , $g'b$, g^\sharp , a^\sharp , c' , as well as the corresponding notes of the second octave, are in the same category. The $d'''b$ is the second harmonic (the *twelfth*) of the true $g'b$ (fingered as the f^\sharp), assisted by the c^\sharp hole as a vent-hole, and slightly flattened by the closing of the e hole. The d''' is the third harmonic (the *fifteenth*) of d' , assisted by the c^\sharp hole as a vent-hole. The d'''^\sharp is the harmonic *fifteenth* of d^\sharp , assisted by the g hole, an improper vent-hole. The fingering of e''' is still common, but it gives a false note, which is really the same harmonic as the last, but sharpened by the a hole. It will be observed that there is no $f'''b$. The f'''^\sharp deserves special mention as it is the only theoretically true note in the third octave of any of the early tables of fingering, with the exception of the a''' of Mersenne. It is the fourth harmonic (the *seventeenth*) of d' , assisted by the correct vent-hole, the b hole. The g''' must also be regarded as the harmonic *seventeenth* of d' , assisted by the b hole and greatly sharpened by the e , f^\sharp and g holes. This note could not have been produced as the harmonic *fifteenth* of g' on account of there being no f^\sharp hole.

It should be noticed that the note-hole for the last two notes is the terminal opening of the flute.

420. Sir John Hawkins (1776) writes: "As the French had set us the example for the practice of the *flûte-à-bec*, so did they for the German or traverse flute. . . . The Sieur Hotteterre *le Romain* of Paris was the first that published instructions for it, . . . and from that time the practice of the *flûte-à-bec* descended to the young apprentices of tradesmen, and was the amusement of their winter evenings."

Concerning a work of great interest, by the Abbé François Ragueneau, first printed in 1702, Hawkins says: "In 1704 was published a small tract entitled *Parallèle des Italiens et des*

François, en ce qui regarde la Musique et les Opéras. The author asserts that the French masters excel those of Italy in their performance on the violin, the hautboy and the flute and celebrates as fine performers on the flute, Philbert, Philidor, Descoteaux and *les Hotteterre*, the latter of whom, says this author, have taught the instrument to lament in so affecting a manner in the mournful airs, and to sigh so amorously in those that are tender, that all are moved by them."

Hawkins does not give the name of the writer of the tract; from the words that he employs, it would appear that he saw only an English translation of a portion of it, which was printed in London in 1709.

The transverse flute was first used in the orchestra of the Paris Opera-house in 1697, Louis Hotteterre being the player. Jean Baptiste Loeillet of Ghent, who settled in London in 1705, was probably the earliest performer on the instrument in this country. See his name in part IV.

421. An instruction-book for the transverse flute, by Michel Corrette (1710), cited by Hawkins as a considerable improvement on that of Hotteterre, is in reality little more than an imperfect copy of it. Corrette, however, adds the elements of musical notation, also a few airs and some small duets. The only original feature of his book is a series of simple tunes with the fingering of every note marked below it. Corrette was organist at the Jesuits' College in Paris; he established a school of music which is said by Fétis to have been unsuccessful although its founder was a most zealous teacher. The Parisian musicians called his pupils "*les anachorètes.*" (*les ânes à Corrette.*)

422. Filippo Bonanni (1722). The flute in its improved form seems to have been long in becoming generally known in the south of Europe, for so late as the year 1722 Filippo Bonanni, in the work before cited, gives an engraving of a musician, in fantastic attitude, performing on such an absolutely impossible "*flauto traversier*" (*sic*) that one is unable to resist the conclusion that Bonanni had never seen the instrument he pretended to

depict, and that he knew very little about it. The *flauto*, as shown by him, resembles the *Floeten* of Virdung and Agricola. The book, a quarto volume of moderate thickness, is splendidly executed, and is in that respect far superior to anything of the kind known to have been published; it is therefore only reasonable to infer that its author would have availed himself of all possible information.

423. The "c' and c'♯ Keys." Quantz says that about the year 1722 the flute was lengthened in order that c' and c'♯ might be produced. The holes for these notes were furnished, as now, with open keys. These are still called the c' and c'♯ keys, though they are placed over the c'♯ and d holes. This extension of the compass was considered by Quantz, and by many others after him, to be "detrimental to the tone of the flute, as well as to its intonation, and therefore this so-called improvement was not generally adopted, and soon fell into disuse." This was no doubt one of the renewed attempts to extend the compass of the flute, mentioned in §412, as it is probable that these two keys (or at least one of them, the c'♯,) were in use long before the time mentioned.

424. A Flute by F. Boie, 1724 ante. This remarkable instrument is in the collection of Mr. Carli Zoeller, who has most kindly entrusted it to me, with several other valuable and interesting flutes, for examination and measurement. It belonged to the celebrated Johann Joachim Quantz, whose grand-nephew, Herr Albert Quantz of Göttingen, presented it to Mr. Zoeller as a relic of his illustrious uncle. It bears the name "*Quantz*" written in ink above the branded name of the maker. It is not unlikely that F. Boie may have been an ancestor of the J. F. Boie, or Boye, mentioned in §384. Whether this was or was not the case, the instrument in question was probably in the possession of J. J. Quantz before he left Dresden for Rome in 1724, and it will be seen in §434 that it is scarcely likely that he used it after 1726.

425. This flute is made of box-wood, tipped and capped with

black horn. The key is of brass. The second and third joints are cracked, and but roughly repaired; the tone is nevertheless good, that of *g'* particularly so, and the intonation is not so false as that of many flutes of the present century.

The second of the four joints is marked 2. This was probably the flattest but one, of an uncertain number of interchangeable joints of different pitches.

There is no screw in the horn cap, nor is there any other convenient means of adjusting the cork. This is now placed at a distance of .72 inch from the centre of the mouth-hole.

As the flute stands at present, its *a'*, blown at the mean between possible sharpness and flatness, has 440 vibrations.

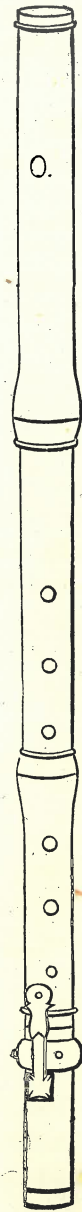
426. The annexed figure is a representation of this interesting relic, drawn to a scale of one quarter.

The thickness of the tube of the head-joint, at the mouth-hole, is .23 inch; that of the second and third joints averages .21 inch. The thickness of the foot-joint varies so much that a record of it would be useless.

427. The lengths of the joints, exclusive of the sockets, are as follows:

	Inches.
Head, from cork, - - -	5.57
Second joint, - - -	8.10
Third joint, - - -	5.41
Foot-joint, - - -	3.22
Entire length from cork, - - -	22.30

FIG. 44.



The mouth-hole is oval, its external diameters being .41 and .37 inch respectively, but it is considerably undercut, and therefore its interior dimensions are much greater.

428. A tolerably accurate idea of the proportions of the bore may be gained from the following table:

Diameter. Inch.		Distance from cork. Inches.
.72	at the cork, - - -	0.00
.72	at the lower end of the head-joint, -	5.57
.72	at the upper end of the second joint, -	5.57
.58	at the lower " " " " , -	13.67
.58	at the upper end of the third joint, -	13.67
.45	at the lower " " " " , -	19.08
.48	at the upper end of the foot-joint, -	19.08
.56	at the open end, - - -	22.30

429. The finger-holes are circular, and much undercut. Their diameters and positions are as shown in the following table:

Finger-holes.	Exterior diameters. Inch.	Distance of centre of hole Inches.	from centre of	
<i>c'</i> #	-	.26	8.85	Mouth-hole.
<i>b</i>	-	.25	1.47	<i>c'</i> # hole.
<i>a</i>	-	.23	1.37	<i>b</i> "
<i>g</i>	-	.24	2.31	<i>a</i> "
<i>f</i> #	-	.24	1.37	<i>g</i> "
<i>e</i>	-	.18	1.38	<i>f</i> # "
<i>d</i> #	-	.32	2.36	<i>e</i> "

Mr. Zoeller has an ivory *eb* flute corresponding exactly in pitch to the flute above described, and therefore probably of the same date and place. This instrument has one square-flapped silver key. It consists of four joints, each of which is composed of several pieces. It bears no name.

430. A Flute by Biglioni of Rome, 1725 *ante*. This curious old flute is also in the collection of Mr. Zoeller, who informs

me that it is believed to have been brought from Rome by J. J. Quantz when he left that city in 1725. Mr. Zoeller obtained it direct from Herr Albert Quantz.

The instrument is in excellent preservation, and appears to have been but little used. Its tone is inferior to that of the flute by Boie. It is made of box-wood, with ivory tips and cap, the latter being connected with the cork by means of a screw, but it is by no means certain that this originally formed part of the flute. "I. BIGLIONI IN ROMA" is branded on each of the four joints.

The only second joint that remains, is marked 4. If, as is probable, this was the sharpest but two, of six interchangeable joints, the flute may be estimated to stand at nearly its original average pitch. I find that the *a'*, when blown at the mean pitch of the instrument, has 441 vibrations.

The thickness of the tube of the head-joint at the mouth-hole is .2 inch; that of the second joint averages .2 inch; that of the third joint and the foot, .24 inch.

431. The lengths of the joints, exclusive of the sockets, are as follows.

The cork is placed at a distance of .74 inch from the centre of the mouth-hole.

	Inches.
Head, from cork, - - - -	5.75
Second joint, - - - -	8.11
Third joint, - - - -	5.19
Foot-joint, - - - -	4.15
<hr/>	
Entire length from cork, - - -	23.2

The mouth-hole is oval; its exterior diameters being .38 and .36 inch respectively. It is much undercut.

432. The subjoined table gives sufficient indications of the bore :

Diameter.		Distance from cork.
<i>Inch.</i>		<i>Inches.</i>
.74	at the cork, - - - -	0.00
.74	at the lower end of the head-joint, - -	5.75
.72	at the upper end of the second joint, - -	5.75
.59	at the lower " " " " " " - -	13.86
.60	at the upper end of the third joint, - -	13.86
.48	at the lower " " " " " " - -	19.05
.50	at the upper end of the foot-joint, - -	19.05
.44	at the open end, - - - -	23.20

433. This flute has the usual six uncovered finger-holes, which are much undercut, and, in addition to the ordinary closed key of the *d*[#] hole, it is provided with a jointed open key, the flap of which surmounts a lateral *d*[#] hole. The little finger of the right hand closes this key, and the flute then gives *c*[#]. The keys are of silver; they work between knobs, and they have square flaps furnished with flat leathers. The six uncovered finger-holes are circular. The holes beneath the two keys are oval. The sizes and positions of all are shown in the subjoined table.

Finger-holes.	Exterior diameters.	Distance of centre of hole.	from centre of
	<i>Inch.</i>	<i>Inches.</i>	
<i>c</i> [#]	.26	8.62	Mouth-hole.
<i>b</i>	.26	1.49	<i>c</i> [#] hole.
<i>a</i>	.24	1.51	<i>b</i> "
<i>g</i>	.26	2.16	<i>a</i> "
<i>f</i> [#]	.26	1.47	<i>g</i> "
<i>e</i>	.21	1.49	<i>f</i> [#] "
<i>d</i> [#]	.38 X .34	2.32	<i>e</i> "
<i>d</i>	.34 X .31	1.78	<i>d</i> [#] "

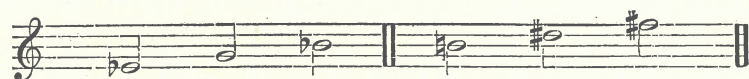
434. The Flute of Quantz, 1726. An interesting improvement made by this justly renowned musician, while he was staying in Paris in 1726, was the addition of a second closed key to the foot-joint, not only to make the difference between *d*[#]

and e_b , but also, as will be seen by his table of fingering in §436, to improve other notes. Neither the description of this flute, nor the method of playing upon it, was published until 1752, but as the extra key was added in 1726, the flute and its fingering are described in this place.

With the exception of the two keys for d^\sharp and e_b , the flute of Quantz seems to have been of the usual pattern of the period; it was probably made of box-wood or ebony; it consisted of four pieces, and there were five extra second joints of different lengths for altering the pitch, as described in §326; it was provided with a screw-cork, and its circular mouth-hole had a diameter of .4 inch. Though Quantz lays great stress on the importance of the dimensions of the bore and the thickness of the wood, he supplies no measurements for either, nor does he give any indications of the sizes or positions of the finger-holes, but it is evident from the fingering that the latter were considerably less than those of Mersenne's flute.

Quantz, writing, as he says, more than twenty years after the introduction of the second key, deplors the absence of a general recognition of its merits. As a matter of fact, his key does not appear to have been used out of Germany, although it was constantly made and highly recommended by Tromlitz of Leipsic down to the beginning of the present century, and although the work of Quantz (1752) obtained a European celebrity.

435. Quantz's Fingering. The uses of the two keys will be easily understood from Quantz's table of fingering, given in the next section. The tuning was so arranged that the diatonic semitone, d to e_b (made by opening the key marked 1 in the table) was one fourth greater than the chromatic semitone d to d^\sharp , (made by opening the key marked 2). Quantz considered the meantone to consist of nine commas $\frac{9}{80}$, which is not very far beyond the truth, and he allotted five commas to the diatonic semitone and four to the chromatic semitone. He says that by means of the alternate use of these two keys the common chords of e_b and b^\sharp were rendered perfectly in tune.



With key 1.

With key 2.

In the examination of the following table it should be remembered that the meantone temperament, or as near an approach to it as could be obtained, was in general use in the time of Quantz, therefore he was perfectly consistent in making the enharmonic differences (such as those between d^\sharp and e_b , e and f_b), and though he did not succeed in obtaining twenty-seven notes to the octave (see §269) it will be seen that he used eighteen in the first octave and twenty-five in the second, which rendered the scale, from his point of view, much more correct than it would have been with thirteen.

436. The following fingerings are transcribed from the original table of Quantz, but their arrangement has been altered in order that they might be conveniently compared.

1L	●	●	●	●	●	●	●	●
2L	●	●	●	●	●	●	●	●
3L	—	—	—	—	—	—	—	—
1R	—	—	●	●	●	●	○	○
2R	—	—	●	●	●	●	○	○
3R	—	—	—	—	—	—	●	●

The Keys. 2 1 1

1L	●	●	●	●	●	●	●	●
2L	●	●	●	●	●	●	●	●
3L	—	—	—	—	—	—	—	—
1R	—	—	●	●	●	●	○	○
2R	—	—	●	●	●	●	○	○
3R	—	—	—	—	—	—	●	●

The Keys. 2 1 1

437. An analysis of those fingerings of the above scale which have not been previously explained, may be found useful.

The fingering of $b''b$ is of a good type, as it gives the second harmonic (the *twelfth*) of $e'b$, improved by the opening of the a hole as a vent-hole. This hole, being placed above its correct position as a note-hole, in order to bring it within reach of the finger, was not very far removed from its correct position as a vent-hole for $b''b$. This was a favourite fingering of the celebrated Charles Nicholson, and was much in vogue for many years. The $c'''b$ is simply the $b''b$ sharpened by means of the

$b''b$ hole. The $b'''b$ may be regarded either as a $b''b$, the harmonic *twelfth* of $e'b$, much sharpened by the $c\#$ hole, or as a $c'''b$, the harmonic *twelfth* of $f'\#$, assisted by the $c\#$ hole and much flattened by the closing of the $f\#$ and e holes. The $d'''b$ is a harmonic *twelfth* of a true $g'b$ (with the fingering given for $f'\#$), assisted by the $c\#$ hole. The $c''\times$ is a harmonic *twelfth* of $f'\times$, improved by the $c\#$ hole: this is now the accepted method of forming d''' . The first fingering for d''' gives the harmonic *fifteenth* of d' , assisted by the $c\#$ and $f\#$ holes as vent-holes. The $f'''b$ was fingered according to the only practicable method on such a flute: it may be described as the harmonic *fifteenth* of $f'\#$, assisted by the opening of the a hole, and flattened by there being no hole for f . This fingering gives a wretched note; it has long been discarded in England and in France. The $f'''b$ is like that given by Mersenne. The $g'''b$ is really the same harmonic as the $g'''b$, still further sharpened by the $c\#$ hole. The a''' is the fifth harmonic (the *nineteenth*) of d' assisted by the e and $c\#$ holes. The note-hole for the last four fingerings is the terminal opening.

438. Quantz gives elaborate directions for the improvement of the imperfect notes of his scale. Sometimes he recommends the turning inwards or outwards of the flute, sometimes the partial closing or unclosing of certain holes for the correction of those defects which he seemed to consider otherwise irremediable. He also lays great stress on the importance of the ear of the performer being adapted for music, and on the necessity for acquiring a knowledge of the proportions of the intervals of the scale. He further says: "It is of great advantage to a flutist if he know how to make a flute himself, or at least how to tune it."

439. Gerhard Hoffmann, a famous mathematician and architect born at Rastenburg in 1690, is said by Gerber, who gives Walther (1732) as his authority, to have improved the flute by the addition of a key. Fétis, and also Mendel and Reissman, repeat the statement of Gerber, but a careful search through the work of Walther proves that this author does not even mention

the name of Gerhard Hoffmann, and I have not been able to find any particulars of the alleged improvement, or any foundation for the above statement. The error has been again repeated in the catalogue of the Museum of the Brussels *Conservatoire*.

Koch (1865) says that Gerhard Hoffmann added two keys to the hautboy in 1727, but he does not connect the name with any improvement of the flute.

440. The "Modern Musick-Master," 1730. At this period the flute appears to have undergone no further change of any importance, though its popularity was increasing and the best composers were writing for it. In England it was still called the German flute, its precursor, the *flûte-à-bec*, or "common flute," being in more general use, but notwithstanding the efforts that were made to maintain the latter in public favour, it was being rapidly supplanted by its vastly superior rival.

The Modern Musick-Master (1730), previously cited, affords testimony as to the condition of the flute in England at the above-mentioned date. The work consists chiefly of a series of small instruction-books for various instruments, amongst which is included *The Newest Method for Learners on the German Flute, as Improved by the greatest Masters of the Age*. This contains "A Scale of all the Notes and Half Notes of the German Flute, Musically and Tabularly," in which the fingerings are the same as those in the work of Hotteterre. There is only one key mentioned; the scale does not ascend higher than g''' ; the notes with flats are fingered in the same way as the corresponding notes with sharps, except in one unimportant instance, and, as in Hotteterre's work, there is no fingering for f'''' . This part of the book is but a poor translation of Hotteterre, with the addition of "a collection of the finest Minuets, Rigadoons and Opera Airs extant."

441. An early "Bass Flute." In the Museum of the *Conservatoire National de Musique* in Paris, there is a "bass flute," the gift of M. Dorus. This instrument is made of box-wood, and its three keys are of brass. It is branded with the inscription "J. BEUKER, AMSTERDAM." I have made many unsuccessful

efforts to discover the exact date of its manufacture, which was probably about the middle of the last century.

According to the late M. Chouquet (1884), its entire length is 1.23 metre, or 48.2 English inches, and "it was generally called *une flûte de 5 pieds*." As a matter of fact, its entire length nearly corresponds to five of the short Hesse Darmstadt feet, which would amount to 1.25 metre, or 49.214 English inches. The sounds of this tremendous flute are, of course, about an octave below those of the ordinary concert-flute, its lowest note being d instead of d' . M. Léon Pillaut, the successor to M. Chouquet as conservator of the Museum, has kindly furnished me with the following additional particulars concerning it.

442. There is no screw to the cork. There are seven finger-holes, including that for $d\sharp$. The $f\sharp$, g , $b\flat$ and $c\sharp$ holes are uncovered, but the holes for e and a have open keys, these being double levers. The $d\sharp$ hole has the usual closed key. All the keys work between knobs.

The dimensions of the bore, reduced from M. Pillaut's measurements to English inches, are as follows:

Diameter.		Distance from cork.
1.19	at the mouth-hole,	1.22
1.24	at the upper end of the second joint,	12.98
1.06	at the lower end of the second joint,	26.96
0.88	at the lower end of the third joint,	35.95
0.98	at the open end,	44.70

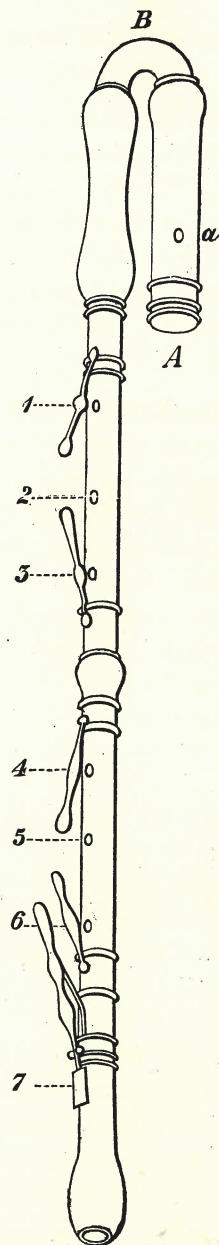
443. A "Bass Flute" in *g*, 1751 *ante*. The annexed wood-cut is a copy of an engraving in Vol. IV. of the "*Recueil des Planches*" of the Encyclopædia of Diderot and D'Alembert. The following description is a translation of Diderot's article "*Basse de Flûte traversière*," in the second volume of that work (1751). "This instrument sounds a *fifth* below the [ordinary] transverse flute, which it closely resembles, excepting that it is larger and that its head-joint is curved so as to bring the mouth-hole, *a*, nearer to the finger-holes.

"The elbow, *B*, which unites the head-joint, *A*, to the other part of the instrument, is a tube of brass, the ends of which fit into two sockets that are made in the joints which it connects.

"The holes 1, 3, 4 and 6, which could not be reached by the fingers on account of the length of the instrument, are covered by the keys opposite to them. These keys are so made that they are kept open by their springs unless they are pressed down by the fingers, the valves being between the touches of the keys and the pivots, but the pivot of the *eb* key is between the valve and the touch.

"This instrument serves as the bass in concerts of flutes. Its lowest note is *g*, that is, as before mentioned, a *fifth* below the ordinary flutes of two feet [*pieds de roi*] in length. The fingering of this flute

FIG. 45.



is the same as that of the ordinary flute. The instrument, which is of box, or other hard wood, is fashioned in a turning lathe."

444. By an odd mistake, the hole, No. 4, is figured in the touch of the key, instead of in the flute itself. This is corrected here, *fig. 45*.

The bore of this flute cannot be determined with certainty, but it appears, from the open ends of the joints, as shown in engravings of the separate parts, to have been very slightly conoidal, at least in part. The thickness of the tube seems to have been enormous.

445. The Essay of J. J. Quantz; (1752). Some account of the important work of Quantz, so frequently quoted in these pages, has been already given, and further extracts will be found in parts III and IV, but this author exercised so beneficial an effect on musical art in general, as well as on flute construction and playing, that his essay deserves special mention in this, its chronological place in this history. Quantz dedicated his work to his pupil, Frederick II. of Prussia, a most enthusiastic amateur of the flute, who, according to his instructor, achieved a high degree of perfection.

Notwithstanding the great attainments of Quantz, and his indubitable refinement of ear, it does not appear that he ever entertained the idea of effecting any radical improvement in the flute. As he found it, so he appears to have left it, with the exception of the slight advantages afforded by the second key; by the primitive wooden tuning slide, which he claims to have invented in 1752 (see §327), and by some improvements that he made in the bore and the tuning. As before stated, there is no good reason to believe that he invented the screw-cork, although he is said by Tromlitz to have done so. There is, however, no doubt that he made the very best use of the limited resources at his command, and contributed more than any other musician of his time to render his instrument not only popular, but worthy to be employed in the performance of high-class music.

446. A Flute by T. Lot, 1756 *circa*. Thomas Lot was, in

1752, one of the five "*maîtres constructeurs*" of wind-instruments established in Paris. In 1770 he was a member of the "*corporation des luthiers*" of that city. In 1785 he was still carrying on his business in the *Rue de l'Arbre-sec*.

Amongst the instruments kindly lent to me by Mr. Zoeller, is a concert-flute by this maker, branded with the name "T. LOT." Beneath the name is a lion rampant. The flute is of box-wood, with ivory tips and cap. It consists of four joints, and has one square-flapped silver key, on knobs, which closely resembles in shape the key of the flute by Boie. The cap screws on to a wooden plug which passes through it, but which is not now connected with the cork, though perhaps it was originally so connected.

The *a'* of this flute has but 400 vibrations, it is therefore nearly three vibrations below our present *g'*. There is no indication of there having been any interchangeable second joints. The tone can only be characterized as execrable.

447. The cork is placed at a distance of .74 inch from the centre of the mouth-hole. The lengths of the joints, exclusive of the sockets, are as follows:

	Inches.
Head-joint from cork, - - -	5.65
Second joint, - - -	9.20
Third joint, - - -	5.30
Foot-joint, - - -	3.05
Entire length from cork, - - -	23.20

448. The proportions of the bore are very peculiar, as will be seen from the following measurements:

Diameter.	Distance from cork.
Inch.	Inches.
.74 at the cork, - - -	0.00
.72 at the lower end of the head-joint, - -	5.65
.79 at the upper end of the second joint, - -	5.65
.63 at the lower end of the second joint, - -	14.85
.65 at the upper end of the third joint, - -	14.85
.54 at the lower end of the third joint, - -	20.15
.58 at the upper end of the foot-joint, - -	20.15
.66 at the open end, - - -	23.2

I have not considered it necessary to give particulars of the finger-holes.

Mr. Zoeller estimates the date of the manufacture of this flute to be about 1756.

449. **The Scale of Fingering in the French Encyclopædia.** In the first edition of the above work Vol. VI (1756), there is a long article on the flute, edited, if not written, by Diderot. The scale of the *flûte traversière* (with one key), as there given, extends considerably higher than any, published previously, that has come under my observation. The extra notes are fingered as follows:

The diagram shows a musical staff with five notes: b^{\flat} , b^{\natural} , c^{\sharp} , d^{\sharp} , and e . Below the staff, fingerings are indicated by circles. The left hand (L.) has three fingers (1, 2, 3) and the right hand (R.) has three fingers (1, 2, 3). A key is also indicated. The fingerings are as follows:

Note	1L.	2L.	3L.	1R.	2R.	3R.	Key.
b^{\flat}	●	○	○	○	○	○	○
b^{\natural}	●	○	○	○	○	○	○
c^{\sharp}	●	○	○	○	○	○	○
d^{\sharp}	○	○	○	○	○	○	○
e	○	○	○	○	○	○	○

* Hole half closed.

The above b^{\flat} is the fourth harmonic (the *seventeenth*) of g^{\flat} , assisted by the *a* hole, but injured by there being no hole for f^{\sharp} . The b^{\natural} is simply a sharpening of the previous note by partially uncovering the *b* hole. The c^{\sharp} is the sixth harmonic of d' (the *twenty-first*), assisted by the *e*, *g* and *b* holes, each of which is one below the true vent-hole. The c^{\sharp} is but a sharpening of the c^{\sharp} . The d^{\sharp} would be the triple octave, the seventh harmonic, or the *twenty-second*, of d' . It is explained, in the article, that "the high notes, *b*, *c* and *d* cannot be sounded on all flutes, but the larger the instrument the easier is their production. They may be obtained from the *flûte d'amour*, and with greater facility, from the *basse de flûte traversière*."

450. A "Bass Flute" by Delusse, 1760 circa. M. Pillaut

has informed me that since the publication of M. Chouquet's catalogue, the Museum of the *Conservatoire* has received an interesting addition in the shape of another bass-flute, of which he has most kindly sent me the following particulars: The instrument is similar in construction to that described in §443 and 444. It is slightly longer than the bass-flute of Beuker. Measured along the centre of the entire bore, its extreme length, including the button, is just fifty inches. The interior diameter of the head-joint is 1.1 inch, and the bore throughout is from .1 to .05 inch less than that of Beuker's flute, except at the open end, where it expands to 1.04 inch. This flute bears the name of the noted French maker, DELUSSE.

I have recently had an opportunity of seeing this curious instrument, and I find that it is made of box-wood, stained dark brown. It has ivory tips, and the keys are of brass. The key of the $c\sharp$ hole is wanting, and one of its knobs is broken.

451. The "Extra Keys" for f , $g\sharp$ and $b\flat$, 1774 ante. The most important improvement that has been made in the flute, since the introduction of the $d\sharp$ key, was the addition of finger-holes for the notes $f\sharp$, $g\sharp$ and $b\flat$. In order that the general fingering of the one-keyed flute might not be altered, these holes were at first covered by closed keys that might be used, or not, according to the will, or skill, of the player. The positions of the extra holes may be roughly described as follows: the $f\sharp$ hole is between the e and $f\sharp$ holes; the $g\sharp$ hole is between the $g\sharp$ and a holes, and the $b\flat$ hole is between the a and $b\flat$ holes.

The $f\sharp$ key seems to have been generally placed across the flute, so that it might be opened by the third finger of the right hand. The $g\sharp$ and $b\flat$ keys were generally placed longitudinally, the former being opened by the little finger, and the latter by the thumb, of the left hand: see *fig. 51*, §555.

Besides the advantages conferred on the two lower octaves of the flute by the $g\sharp$ and $b\flat$ keys, there was a great improvement effected by them in the f''' , as by fingering the usual e''' and opening these two keys an excellent f''' was obtained which

has since been in constant use. It will be remembered that this note was so false on the one-keyed flute that it was altogether discarded by Louis Hotteterre and others. The $f\sharp$ key was, however, the most useful of the three, for it not only afforded the means of making a good f''' , as a harmonic of $f\sharp$, but of superseding the worst notes of the one-keyed flute, the $f\sharp$ and f'' with the "fork-fingering."

452. Widely differing views have been expressed concerning the authorship of these three keys and the dates of their invention. As there does not appear to be any sound basis for forming an opinion on the former point, I abstain from speculating on the subject, but it is necessary to observe that there is no reason to believe that the keys were invented by our countryman Joseph Tacet, as has been supposed, although he was certainly one of the first to use them: see his name in part IV. Fétis states positively that the $g\sharp$ and $b\flat$ keys were invented by Peter Nicholas Petersen, a flute-player of Bremen, and that he was assisted by a wind-instrument maker named Wolf, but it will presently be seen that Petersen, having been born in 1761, could not have been more than thirteen years of age when they first began to come into use, therefore it seems scarcely probable that he was their inventor.

453. Although the year in which the three above-named keys were introduced cannot be precisely determined, there are sufficient grounds for the conclusion that they were beginning to be known and appreciated at a period verging on 1774. It is evident that in 1775 they were unknown in Berlin, then the head-quarters of flute-playing in Germany, or they would have been mentioned in Lambert's excellent paper on the flute (see § 457). They cannot be said to have been known in France, even ten years later, for in the *Encyclopédie Méthodique* (1785) there is this statement: "It is pretended that an English Musician has constructed a flute with seven keys in order to obtain all the semitones." The only keys known to the writer of the article were the ordinary one for $d\sharp$ and the extra one of Quantz. There is fairly good evidence that the keys in question

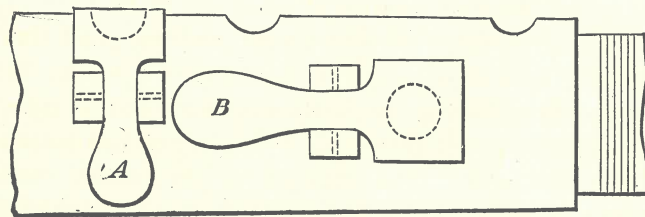
were not in general use in this country in 1776, for in a curious *Compleat Instructor*, printed in London, and, according to the catalogue of the British Museum, in that year, only one key is mentioned. Tebaldo Monzani came from Italy to this country in 1788. He was then using a one-keyed flute, and did not adopt the extra keys until some years afterwards. The earliest English publication, that I have been able to find, in which four keys are mentioned, is the specification of patent by Richard Potter (1785). The earliest English instruction-books treating of more than one key are an anonymous work (1789 *circa*), and the first edition of Wragg's well-known *Flute Preceptor* (1790 *circa*). Further mention of these will be found in §477.

On the other hand there is almost positive proof that the three extra keys were known in Germany in 1780, for Ribock (1782) speaks of having constantly used them at that time, and he says that they were then made by Kusder of London, and by Tromlitz of Leipsic. The evidence of their being made in London as early as 1774 is almost conclusive: in an interesting biography of Andrew Ashe, printed in the *Dictionary of Musicians* (1827), there is a circumstantial account of a six-keyed flute which was made by Richard Potter of London; taken to the Hague by a flute-player named Vanhall, a brother of Johann Vanhall of Vienna, and sold to young Ashe about the close of the year 1774: see the name ASHE in part IV.

454. Revival of the "Low *c* and *c*[♯] Keys." Two of the six keys of the above-mentioned flute were for the production of *c*[♭] and *c*[♯]. On the subject of these two keys Cornelius Ward (1844) writes thus: "Twenty-five years after Quantz and Frederick the Great delighted themselves and the court of Berlin, we find Florio using what were then called the extra keys in the orchestra of the Italian Opera in London, and he it was that re-invented the keys for the low *c*[♯] and *c*[♭]. He so prized this invention that he placed a small curtain upon the foot of his flute to prevent the discovery of the means by which he produced these notes, and he taught his daughter to make the keys that the secret might be kept in his family."

455. The *c*^{''} Key. The next great improvement, after the introduction of the *f*, *g*[♯] and *b*[♭] keys, was a hole for *c*^{''}, placed in its correct position between the *b* and *c*[♯] holes. The hole was at first governed by an open key which it was necessary to keep generally closed by the thumb of the left hand. This invention was also improperly ascribed to Petersen by Fétis, but its real origin is as obscure as that of the other keys. Ribock claims the invention of a closed key for the *c*^{''} hole. The wood-cut below is taken from his engraving. (1782.)

FIG. 46.



A. The closed *c*^{''} key, B. the closed *b*[♭] key; both opened by the thumb of the left hand.

456. The addition of the *c*^{''} hole rendered the flute a really chromatic instrument, as every note of the chromatic scale thus became provided with a special note-hole, but, apart from the fact that all the finger-holes, excepting those for *g* and *c*^{''}, were incorrectly placed, a subject that will hereafter be treated at length, the keys were so arranged that they were difficult to use in certain passages, and on that account there arose a strong and not altogether unfounded prejudice against them. It was many years before their advantages were fully understood, and even to this day the fork-fingerings are used, especially in Italy and Germany, for the sake of facility in the execution of rapid passages, but of course at the sacrifice of intonation and quality of tone.

457. The Flute as described by Lambert. (1775.) Jean Henri Lambert, a Frenchman by birth, was a distinguished

mathematician and philosopher, as well as an amateur flute-player. From the year 1764 until his death in 1777, he resided in Berlin, and was an active member of the *Académie Royal des Sciences* of that city. His well-known paper, entitled *Observations sur les Flûtes* (1775), is particularly interesting as it contains probably the earliest account of the exact measurements of the tube of a flute and its perforations. This paper was published in Berlin in 1777, only four years after the death of Quantz; it contains no allusion to the second key, but there is something like implied censure on the excellent old musician, and the extreme nicety of his views with regard to intonation, in the words: "to entertain [the question of avoiding so minute an error as that of a comma, is to carry the desire for perfection beyond reasonable limits."

458. The flute described by Lambert was of wood, with ivory or horn mountings. It consisted of four joints, and it had a bore that tapered, irregularly, from the cork to the open end.

Lambert gives the dimensions in lines of the Rhenish, or Prussian, foot (0.3138535 metre). His measurements are here reduced to English inches and decimals of an inch for convenience of comparison.

459. The thickness of the head-joint at the mouth-hole was .2 inch; that of the second joint .17 inch, and that of the third and fourth joints .23 inch.

The lengths of the joints, exclusive of the sockets, were as follows:

	Inches.
Head-joint, from cork, - - -	6.35
Second joint, - - -	9.23
Third joint, - - -	4.59
Foot-joint, - - -	3.43
	<hr/>
Entire length from cork, - - -	<u>23.60</u>

There is no mention of any contrivance for altering the pitch of the instrument.

The cork was not provided with any apparatus for its adjustment. Its distance from the mouth-hole was .81 inch.

The mouth-hole was oval, and its external diameters were .35 and .33 inch respectively. It was undercut to such an extent that its interior dimensions were double those of the exterior.

460. The proportions of the bore were approximately as follows:

Diameter. Inch.		Distance from cork. Inches.
.75	at the cork, - - - - -	0.00
.77	at the mouth-hole, - - - - -	0.81
.71	at the lower end of head-joint and the upper end of the second joint, - - - - -	6.35
.57	at the lower end of the second joint and the upper end of the third joint, - - - - -	15.58
.52	at the lower end of the third joint, and the upper end of the foot, - - - - -	20.17
.51	at the d^{\sharp} hole, - - - - -	21.15
.54	at the open end, - - - - -	23.60

The very slight enlargement at the mouth-hole was probably accidental, as such distensions often occur, in unlined head-joints of wood, through the action of heat and moisture.

461. The d^{\sharp} hole was furnished with the ordinary closed key. The e and c^{\sharp} holes were oval. All the finger-holes were undercut to the same extent as the mouth-hole. Their sizes and positions are shown in the following table.

Finger-holes.	Exterior diameters. Inch.	Distance of centre of hole Inches.	from centre of
c^{\sharp}	.27 x .26	9.64	Mouth-hole.
b	.26	1.58	c^{\sharp} hole.
a	.26	1.42	b "
g	.26	2.39	a "
f^{\sharp}	.26	1.53	g "
e	.24 x .23	1.51	f^{\sharp} "
d^{\sharp}	.25	2.27	e "

462. As nearly as can be estimated from the data given, the *a'* of this flute would have had but 398 vibrations, that is, about 24 vibrations less than that of the orchestra of the Berlin Opera in 1752. From the similarity between the pitch of this flute and that of Thomas Lot's, it may be assumed that Lambert's instrument was of French manufacture.

463. The most noteworthy feature in Lambert's paper is a scale showing the lengths of a series of "simple tubes, open at both ends, which would give the thirteen sounds of the first octave of the chromatic scale [*d'* to *d''*], these lengths having been calculated according to the meantone temperament."

It is astonishing that the author, having thus arrived at the very threshold of complete regeneration, should have failed to see that it was only necessary to take one step further in order to render the flute a comparatively perfect instrument, but he seems to have regarded his flute as if it had been a production of nature, neither requiring nor being susceptible of any radical improvement. His paper, clever and interesting as it undoubtedly is, does not appear to have led to any immediate improvement of the flute.

464. **The State of Flute-playing in England in 1776.** Writing at this date, Hawkins tells us: "The German or traverse flute still retains some degree of estimation among gentlemen whose ears are not nice enough to inform them that it is never in tune."

In a posthumous foot-note, printed in a late edition, we are informed that "this is an objection that lies in common against all perforated pipes; the best that the makers of them can do is to tune them to some one key, as the hautboy to *C*, the German flute to *D*, and the flûte-à-bec to *F*; and to effect this truly is a matter of no small difficulty. . . . For these reasons some are induced to think, notwithstanding what we hear daily of a fine embouchure and a brilliant finger, terms nonsensically applied, as they are, to the German-flute, that the utmost degree of proficiency on any of these instruments is scarcely worth the trouble of attaining it."

This is not much to the credit of the flute-players in England at that time, for the worst of flutes, in skilful hands, can be made better in tune than any instrument of fixed sounds tuned according to meantone temperament, which, whether general or not in those days, was certainly the only temperament used for organs. Had Hawkins been acquainted with the advantages of the additional keys, then coming into vogue, he might have been somewhat less severe in his remarks.

465. **An Instruction-book by Antonio Lorenzoni, Vicenza (1779).** Apart from the bibliographical and antiquarian interest with which this exceedingly rare and valuable work is invested, it throws much light on the state of flute-playing at the time and place of its publication; and thus affords good proof that the art was, to say the least, no further advanced in Italy, at this period, than in England, France or Germany.

The book has now little intrinsic value, as it is nothing more than an abridgement of that by Quantz except as regards the scale of fingering, which is for a one-keyed flute and is a literal transcription of that in the Encyclopædia of Diderot and D'Alembert: see §449.

466. **Dr. Ribock's "Bemerkungen" (1782).** A most exaggerated importance has been given to these prolix and tiresome "Remarks" by those who have commented upon them. Of intrinsic value they possess little, and such attention as they deserve is chiefly owing to the evidence that they give concerning the period of the introduction of the additional keys. Gerber speaks the literal truth in saying that Ribock tried to improve the scales by adding keys to the flute. He added two, but it will be seen that these were contrivances for acting on apertures already existing, one of them being the *c''* key shown in *fig. 46*, and the other an *f♯* key which was opened by the thumb of the right hand. Ribock says that the hole for this key was made "between *d* and *e*." Of course he means the *e* and *f♯* holes, but it appears that he alludes to the holes that are closed in making the notes, ignoring the fact that holes, when closed, virtually cease to exist. Gerber says also that Ribock

invented a kind of key which closed better than any that had been made. This invention consisted in causing the flap of the key to hang on a pivot, so that it might be self-adjusting, and in soaking the leather of the key with grease of various kinds.

Some of the wildest mis-statements that have been made with regard to the history of the flute, are due to Ribock's commentators, not one of whom, excepting Gerber, appears to have understood him. It will be necessary to rebut some of these assertions.

467. Ribock tried many experiments on the bore of the flute, but it does not appear that any of those alterations ever led to any real improvement. He also experimented on the mouth-hole, and he reduced, *exteriorly*, the thickness of the part of the head-joint surrounding the mouth-hole, making a sort of excavation to receive the lower lip, by means of which he thought to gain increased command of tone, and to prevent the flute from slipping on the chin. That slight change is mentioned by Fétis as "the contraction of the tube towards the mouth-hole, an idea afterwards adopted by Boehm." If the reader will refer to §341, he will see that Boehm's idea was of a totally different nature, namely, the contraction of the *bore* of the tube at the upper extremity. Ribock made no alteration in the bore of the head-joint.

468. Fétis says also that Ribock added two keys, which made them five in number, and that, by means of those, performers were able to execute many shakes which were previously impossible, and to play in all the keys. Ribock gives tables of fingering for a flute with five keys, the fifth being the extra $d\sharp$ key of Quantz, but none of those keys were added by Ribock, nor does he assert that they were. The $c''\flat$ key of Ribock is mentioned only in an appendix, and does not appear in the tables of fingering; neither does the $f\flat$ key for the thumb of the right hand.

469. There is a very puzzling statement in the early part of Ribock's book, which I venture to think I have succeeded in

unravelling. Speaking of a discovery that was made at an uncertain period, "not more than twenty years" before the time of his writing, he says that it was made either by Tromlitz of Leipsic, or by a musical instrument maker of London named Kusder, for in spite of all his efforts he has not succeeded in finding it on any other flutes than those by the two makers above mentioned. As regards the invention, he says "that below the hole of the next lower half-tone a new opening is made, and provided with a key." (*dass unter dem Loche des zunächst tiefern Halbtones eine neue Oeffnung gemacht, und mit einer Klappe belegt wird.*) Both men do the same, but the positions of their $g\sharp$ and $b\flat$ keys differ."

This quotation can only be read by the light of Ribock's peculiar method of naming the finger-holes of the flute, mentioned in §466. For instance, he would have termed the hole for $b\flat$ the *a* hole, because by closing that hole $b\flat$ is changed to *a*. Now, an opening below this hole (that is, between the true *a* and *b* holes) would give, of course, $b\flat$. By a similar reasoning we are enabled to understand Ribock's notions with regard to the $g\sharp$ and $f\flat$ holes, which were, of course, below what he considered the $g\flat$ and $e\flat$ holes. He says that the keys for $f\flat$, $g\sharp$ and $b\flat$ were not generally known until 1782, but that he used them two years before that time.

It seems improbable that Ribock's surmise, as to these keys being invented at a period verging on twenty years before the date of his book, can be correct, and I cannot think that if they had been discovered at the time he supposes, 1762, such an important improvement could have lain dormant until 1774: see §§451-3.

470. No mention is made of Kusder by any author of the last century except Ribock, as far as I am able to judge, therefore a statement in the catalogue of the museum of the Brussels *Conservatoire*, to the effect that Kusder invented the $f\flat$ key in 1762, may be considered as a misreading of Ribock, the more to be regretted inasmuch as it treats as a certainty that which was only suggested as a possibility. In the same

catalogue is the statement that the *c'* key was invented by a "Hanoverian doctor named *Rodolphe*."

Amid a curious collection of errors concerning the history of the flute, compiled by M. Lavoix and forming part of an otherwise charming and interesting book (1878), the same unfortunate date, 1762, is selected as the precise period at which Kusder, according to the author's imagination, "invented the conoidal bore:" see §415.

471. The Flutes of Tromlitz (1783). In a letter to *Cramer's Magazine*, Tromlitz gives an account of the flutes made by him, with a list of their prices. He says that he has been asked to give an explanation of the construction of his flutes, and of the differences between them and the ordinary flutes made by "the fife-makers." He explains that his great aim was always to ensure perfect intonation, as well as an agreeable and powerful tone, throughout the entire compass of the instrument, two important points that he has never found united in any one flute, for such a flute could only be made by a musician, in the strict sense of the word, and a mathematician. For these reasons he set his own hand to the work. He accounts for what he states to be a well-known fact, that two flutes seldom agree, and three never, by saying that no flutes were made according to definite principles, but that all were tuned by hap-hazard, and he considers the extra keys to be unfit for the performance of rapid passages on account of the difficulty in using them.

The so-called *c'* and *c'♯* keys he once discontinued making, though he was in the habit of making them twenty or thirty years before the date of his letter, but he says that he afterwards resumed their manufacture. He denies that they were invented by the English.

He finishes his letter very much in the style of the oratory of a modern "cheap Jack," and gives a price list of his flutes, a translation of which I append.

The value of the ducat having been nine and four pence, flute-making would appear to have been a lucrative employment in those days.

472. A flute of box-wood, mounted with ivory, with three middle joints and one silver key.	- - - - -	4 ducats.
A similar flute, with five middle joints and a graduated screw-stopper.	- - - - -	6 ducats.
A flute similar to the last, but with two keys, for <i>e♭</i> and <i>d♯</i> , and a register.	- - - - -	8 ducats.
A similar flute, with seven middle joints.	- - - - -	10 ducats.
A flute of the same kind as the last, but with an extra <i>g♯</i> or <i>c♯</i> key.	- - - - -	11 ducats.
A similar flute, but with seven keys.	- - - - -	16 ducats.
A flute like the last, but with a long foot-joint and the <i>c'</i> and <i>c'♯</i> keys.	- - - - -	18 ducats.

Broad ivory bands cost two ducats more, and for ebony, grenadille (cocus) "and such kinds of wood" a further charge of two ducats was made.

Further details of the flutes of Tromlitz will be found in subsequent pages of this chapter.

473. Richard Potter's Patents (1785.) The first English patent for improvements in the flute, was granted to "Richard Potter of Pemberton Row in the City of London, Musical Wind Instrument Maker," on October 28th in the above-named year. The four keys, for *d♯*, *f♯*, *g♯* and *b♭* respectively, were in general use in England at this time, and these are shown in the enrolled drawings. The specification includes the metal tuning slide, the outer tube (see *fig. 18*, §327) of which is covered with wood, presumably for the sake of its appearance when drawn out. The ordinary screw-cork is also included in the patent. The covering of the outer tube is graduated with numbered lines, and corresponding degrees are marked on an ivory pin attached to the cork and protruding through the button.

There is a slide, or "register," at the open end of the foot-joint (see §326), and this is also numbered. The directions are that on the drawing out of the slide in the head-joint to the required pitch, the three sets of numbers must be made to correspond.

The specification also includes the metal plugs, or "conical

valves," mentioned in §384. The knobs of the keys are described as being lined with silver.

It will be seen that there is nothing original in this patent, unless the covering and the numbering of the tuning slide can be considered so, but Richard Potter nevertheless did great service to the English flute-players by introducing the tuning slide and the screw-cork, though he did not invent them. Head-joints thus furnished are still known as "Potter's patent tuning-heads."

The celebrated Cipriani Potter was a grandson of the above-mentioned Richard Potter.

474. The First Work of Tromlitz (1786.) The "Long f Key." The $f\sharp$ key, when placed across the flute, was readily enough governed by the third finger of the right hand, if that finger happened to be disengaged from the sixth uncovered hole for the previous and following notes, but the difficulty of sliding the finger neatly from the key to the hole, and the yet greater difficulty of sliding it from the hole to the key, without permitting the intervention of an $e\sharp$, has generally been considered almost insuperable. In order to avoid this awkward action of the finger, and the alternative of the "fork $f\sharp$," various devices have been employed. Tromlitz, in the above-named work, rightly condemns the $f\sharp$ key of Ribock, for the thumb of the right hand, described in §466. This use of the thumb, as a matter of course, rendered the proper holding of the flute impossible, and Tromlitz invented another key for the same purpose which was free from this objection. This f key, now termed the "long f key," is opened by the little finger of the left hand: it greatly facilitates the smooth alternation of d , or $e\flat$, and f , but when the last mentioned note is preceded or followed by $a\flat$ the left hand little finger has to slide from the long f key to the $a\flat$ key in ascending, and from the short f key to the e hole in descending, operations requiring much practice to perform successfully: see *fig.* 51, §555.

475. Several objections were raised by Tromlitz to the $c''\sharp$ key of Ribock, described and figured in §455, which was con-

sidered by him to occupy the proper place of the left hand thumb, and consequently to interfere with the steadiness of the flute. Another, and a more valid, objection was the difficulty of sliding the thumb from one key to the other. Tromlitz considered that the best arrangement was to have the two keys placed in a line, with a projection between them on which the thumb could rest. He also mentions, but does not then describe, another plan, and he remarks: "Now the flute has seven keys, $e\flat$, $d\sharp$ [Quantz's two keys], $f\sharp$, $f\sharp$ [the long key], $g\sharp$, $b\flat$, and c'' ."

476. "As the e' ," he continues, "was rather weak, I made some experiments: the first was a key with a joint, but which, on account of want of space, was inconvenient; it was also noisy in use so I discarded it. Then I contrived a key without a joint, but the $e\flat$ and $d\sharp$ keys interfered with it, and as, besides, it caused a hindrance in playing, I discarded it also, and I so arranged the size of the hole that the note might be fingered with the $e\flat$ or the $d\sharp$ key open; the e was then as good as the other notes."

This remark shows that Tromlitz was not over particular, for the e hole must have been placed far above its correct position in order that the third finger of the right hand might be able to reach it, the hole was therefore of necessity very much smaller than it should have been, so that even with the $e\flat$ key open the note must have been wretchedly poor.

Tromlitz states that the first of these new flutes was sent to London, and it is not improbable that this was the flute which Joseph Tacet introduced as his own invention, and which gave rise to the statement in the *Encyclopédie Méthodique*, mentioned in §453.

It is stated by Fuerstenau (1832 *post*) that Tromlitz played on an eight-keyed flute in 1786, but it is evident that at that time he recommended but seven keys, and it will be seen, in §478, that he preferred, for his own use, a flute provided with two only.

The book contains no illustrations.

477. "New Instructions for the German-flute . . . as played on by Florio and Tacet" (1789 *circa*). J. Wragg's *Flute Preceptor* (1790 *circa*). The first of these two old instruction-books is anonymous. It is extremely rare; the only complete copy that I have seen is in the library of Mr. Carli Zoeller. In this book there is an engraving of a six-keyed flute, similar to that of Potter described in §518, but without a tuning slide. This instrument is called "Tacet and Florio's new-invented German Flute." Very little use seems to have been made of the extra keys, as they are only indicated in the fingerings for eight notes of the chromatic scale. The flute is described as having three interchangeable second joints and a graduated screw-cork.

The first edition of the once popular work by J. Wragg also treats of but six keys, namely those for c'' , $c''\sharp$, $d''\sharp$, f'' (the cross-key), $g''\sharp$ and b'' . As the author of this little book enjoyed a high reputation as a teacher of the flute, it may be assumed that if any other keys had been known in this country he would at least have mentioned them, even though he might not have approved of them. Wragg's *Flute Preceptor* passed through sixteen editions.

478. *The Second Work of Tromlitz* (1791). At this date Tromlitz published a quarto volume, of about four hundred pages, on the flute and the art of flute-playing. In this excellent book he repeats his former statements as to the keys, and says that they especially improve the shakes. He adds: "They are of great use for those who have been able to master their difficulties, . . . but the most useful flutes have only the e'' and the $d''\sharp$ keys, with the register and the screw-cork."

He agrees with Quantz in condemning the c' and $c''\sharp$ keys, and says that they spoil the tone of the flute. He disapproves of the tuning slide in the head-joint, preferring to use the extra middle joints, or *corps de rechange*.

The only engraving in the book represents a two-keyed flute with the register.

479. *John Gunn's Art of Playing the German-flute* (1793). This work was a noteworthy effort on the part of a clever musician to teach the flute on scientific principles. It is not, like the majority of the works of the eighteenth century which were written with a similar object, simply an extended translation of Hotteterre or an abridged one of Quantz, but it contains much original and useful matter, including a neat little essay on *The formation and various properties of Musical Sound*. This was reprinted by W. N. James (1829). The letter-press portion of the book occupies thirty-two pages, folio.

It is quite evident that the author only knew of the six keys, mentioned in §§453-4, and that he only made occasional use of these, but he was nevertheless strongly impressed with the importance of correct intonation, as may be gathered from the following extract: "One objection made to it, [the flute] as an instrument not admitting of just intonation, or tune, is sufficiently answered by referring to the number of performers who play perfectly in tune; and this objection could only have arisen from hearing it in very imperfect hands."

It is refreshing to read these observations, penned so shortly after the disparaging remarks of Sir John Hawkins.

480. *Méthode pour la Flûte* by Devienne (1795). This was far the most important work on the flute that had been published in France at the above date, and we learn from it that the f'' , the $g''\sharp$ and the b'' keys were then becoming known in that country, but that they were not in general use there. The author seems to have made very little use of them himself, except for the shakes, though he recommended them, and also the c' and $c''\sharp$ keys, to his pupils. The principles of flute-playing taught in Devienne's book are generally admirable. The work has passed through numerous editions; it has been adapted and re-adapted to suit modern requirements, and it has still an extensive circulation in France.

481. *The Third Work of Tromlitz* (1800). In this book there is a plan mentioned by which the duplicate f'' hole was avoided, the single flap of the f'' key having one touch for the

third finger of the right hand, and another, in the form of a lever of the first order, for the little finger of the left hand. There is much to be said in praise of this plan, but it does not seem to have been favourably regarded.

"The $g\sharp$ key," Tromlitz observes, "is placed by the English on the second joint, and the hole is thus brought too high." He placed it on the third joint, and was thus able to keep it in its correct position.

Concerning the $b\flat$ key, he says that the thumb of the left hand is not always at liberty, on account of its being employed to act on the $c''\natural$ key, therefore he "added another $b\flat$ key for the first finger of the right hand, or, instead of it, another lever to the first $b\flat$ key (that for the thumb of the left hand), which worked in the same way as the second lever of the $f\natural$ key." In another chapter we are told that the government of the $b\flat$ key was sometimes given to the third and sometimes to the fourth finger of the left hand, both of which plans are condemned.

The flute of Tromlitz had then eight keys: not the eight keys so well-known in England at the present time, but those for $e\flat$, $d\sharp$, $f\natural$, $f\sharp$, $g\sharp$, $b\flat$, $b\flat$ and $c''\natural$. The c' and $c'\sharp$ were added, if people insisted on having them, but they were not recommended by the author, as he considered that they injured the tone.

482. The subsequent inventions described by Tromlitz are so extremely interesting, and they have exercised such an important influence on the development of the flute, that I have given as close a translation as possible of the author's own words. The following is an account of an open $c''\natural$ key, which he says (in chapter II.) "has the strangest position of any. It lies higher up than the $b\flat$ key, in a straight line with it, and on an elevation. It remains open, instead of being closed like the others, and it is governed by the thumb of the left hand. If it is wished to have a $b\flat$ key with a joint, for the thumb of the right hand, (which in my opinion renders performance more difficult) neither the $b\flat$ key for the left hand thumb nor the c'' key are required, and only a hole for the left hand thumb is necessary. This arrangement was good for c'' but not for $b\flat$."

483. In order to render intelligible the literal translation of the following passage, from chapter VII. of the same work, it has been necessary to interpolate a few explanatory parentheses.

"I must mention another of my inventions, as it may be of use to some one. As numerous keys are a source of trouble to many persons, I thought it might be possible to make a flute without keys, which would possess the same capabilities as one with numerous keys. I made the attempt, and it was successful: all the notes were equally good, and the tuning was excellent, but one single key was indispensable; the fingering alone was difficult. Now that I am old I shall make no more attempts, but I will give the full particulars, which are very simple, so that someone may possibly benefit by them.

484. "All notes in the once-marked octave, when fingered otherwise than in the natural manner [that is, when obtained by fork-fingerings], are dull, for instance: f' , $g'\sharp$, $b'\flat$ and c'' . On the other hand all notes fingered in the natural manner [with their correct note-holes], are clear, as e' , $f'\sharp$, g' , a' , b' and $c''\sharp$. In accordance with these facts I constructed my flute, and I tried so to arrange the fingering as to cause as little departure as possible from the usual method. Thus resulted this scale: d' [from the open end: $d'\sharp$ was of course fingered with the one key], e' , f' , not $f'\sharp$, but this f' is fingered as the $f'\sharp$ usually is, and, in order that f' may be in tune, the hole must be placed nearer the e hole [than the hole for the second finger is generally placed]. For $f'\sharp$ the fingering for f' must be retained, and a hole, which is governed by the right hand thumb, must be opened, so the $f'\sharp$ is pure and good. This hole for the thumb is placed between the f and g holes, at the side of the flute. For f' , $f'\sharp$ and the following notes, the $e\flat$ key, the only one on the flute, is opened. Now follows g' : this is fingered as formerly, only the thumb must close the hole which was opened for $f'\sharp$ [and the left hand little finger must remain on the $g\sharp$ hole]. For $g'\sharp$ the little finger of the left hand must uncover the [$g\sharp$] hole at the side of the middle joint. The a' is fingered as formerly only the $g\sharp$ hole must be closed again by the little

finger. Now follows, not b'_{\sharp} but b'_{\flat} , with the fingering formerly used for b'_{\sharp} . When b'_{\sharp} is wanted, a hole for the left hand thumb is opened.

485. "The two holes for a' and b'_{\flat} are near together, similarly to those for e' and f . Now comes c'' , which is fingered like c''' , therefore it also is clear. In the twice-marked octave it is fingered in the same way. [This repetition seems to imply that the author wishes to lay particular stress on the fact that the c'' and the c''' were produced by means equivalent to the then common fingering: $\circ \bullet \circ \bullet \bullet \bullet \circ$]

"This invention renders all the notes in the first octave free from dulness or inequality, and all the scales are equally easy, but in certain combinations the fingering is difficult. It may be possible for these difficulties to be overcome, but as I was not inclined to recommend this invention I have not proceeded any further with it. Perhaps some one may meet with this account and bring the system to perfection, but it does not yet come up to my arrangement of keys."

The book contains no illustrations.

486. The foregoing extract is an account of probably the first attempt to contrive a system of open holes for a chromatic flute; the author, however, appears to have been careful to retain almost as many veiled notes as possible, for the f , the b'_{\flat} and the b'_{\sharp} were the only notes that were not spoiled by the closing of the holes next below the actual note-holes, and it does not appear that any further attempt was made to place the holes in their correct positions. It will be observed that we are left completely in the dark as to the fingering for c''_{\sharp} , but it may be assumed that the hole for that note was governed by the first finger of the left hand, and that therefore the c''_{\sharp} was fingered in the usual manner.

Tromlitz remarks, in chapter III. of the same work, "they use the fingering of a hundred years ago, simply because it was used by their great-grandfathers." It will not be denied that this was a bold, if not altogether a judicious departure from the established fingering, and the author is entitled to the credit of

having been the first to attempt to break through the old custom of employing six open finger-holes, and four or five closed keys, and thus to pave the way for rendering the flute free from the trammels of what is incorrectly termed "the closed system."

The language in which Tromlitz describes the various contrivances that he employed is not always that which would be expected from an inventor. Sometimes, it is true, he boldly claims a new invention, but at other times his words convey the impression that he is simply explaining something that has come under his notice, and it may be observed that this is particularly the case in his description of the c'' hole and its open key.

487. The *Méthode* of Hugot and Wunderlich, (1801). In this excellent and well-known work it is stated that "the utility of the three keys [f_{\sharp} , g_{\sharp} and b'_{\flat}] having been recognised by many skilful professors, whose opinions have been confirmed by fifteen years' experience, the adoption of these keys is strongly recommended." The authors condemn the " c'_{\sharp} and c''_{\sharp} keys," but they mention the c''_{\sharp} key as being useful for the minor shake on b'_{\sharp} though they do not urge its adoption. The allusion to "fifteen years' experience" seems to imply that they believed the f_{\sharp} , the g_{\sharp} and the b'_{\flat} keys to have been introduced by Tromlitz in 1786, the date of his first book, and exactly fifteen years before the publication of the *Méthode* above mentioned. This work has passed through many editions, and is still popular on the Continent.

488. An Attempt to remodel the Flute by William Close (1802). Allusion has been made, in §146, to certain suggestions for raising the sound of a flute which were never followed out by their author. Close, however, did carry some of his ideas to a practical issue, though an unsuccessful one as far as the flute was concerned. His experiments are detailed at considerable length, and illustrated by carefully executed engravings. They may be summed up as vain attempts to construct a flute without a special finger-hole for each note of the chromatic scale, and to raise the pitch of a flute equally, throughout its compass, by the unclosing of a hole or holes, in the upper part of the tube, and

thus to enable the player to transpose without changing the fingering of the notes.

Close seems to have been very strongly impressed with the advantages of metal as a material for the tubes of flutes.

489. Dr. Pottgiesser's First Effort to improve the Flute (1803.) On the ninth page of the pamphlet of Cornelius Ward, previously quoted, appears the following passage: "The first truly scientific remodelling of the flute, with which we are acquainted, was made in 1803. It was a great improvement upon the ordinary flute, inasmuch as the apertures were placed more nearly in accordance with the acoustical principles of the instrument. The manner of acting on the extra apertures was not, however, so complete as could be desired, from the want of a little mechanical skill in the person who devised it. We have one of these flutes at present by us, but, notwithstanding its superiority, it never came into use, from the obstacles before alluded to, and because the time had not then arrived when such an important improvement would be appreciated."

These remarks have caused a considerable amount of speculation, and some persons have even ventured to express an opinion that the flute of 1803 existed only in the writer's imagination. I never doubted the truth of Ward's statements for I knew him well, and always found him thoroughly honest and straightforward, but although I saw him almost every day for more than twelve months, I was unable to obtain a sight of this mysterious flute, or to gain any information concerning it. Not a word would he say on the subject beyond promising that he would someday show it to me. Circumstances occurred which prevented the fulfilment of a promise that otherwise would undoubtedly have been redeemed, and I remained in complete ignorance of the details of the flute of 1803 until a few months ago, when after searching until I began to despair of success, I at last discovered, in the *Allgemeine Musikalische Zeitung* (1803), a voluminous but excellently written article, with an engraving, which left no room to doubt that the mystery of forty-four years' duration was a mystery no longer.

The article is anonymous, but evidence which will hereafter appear proves it to have been written by H. W. Pottgiesser, Doctor of medicine.

490. Space will permit of but a condensed account of this interesting article, of which the manuscript translation fills ninety-one closely written octavo pages. The title and the opening sentences are as follows:

"On the faults of the flutes hitherto constructed, especially the keyed-flutes, with a proposition for the improvement of the same. The flute is rightly considered one of our most delightful instruments: its soft, sweet tone; its simple construction; its exceptional capabilities, and its peculiar charm, command universal admiration on the part of performers as well as listeners. Nevertheless it has great imperfections, and on close acquaintance with it one cannot help wondering how, particularly in its old form, it obtained so many admirers, but even at the present day there are *virtuosi* who prefer their old faulty instruments to any with the new improvements."

Then follow instances of the faults arising from the imperfect construction of the flutes at that time in vogue, and the author says: "Most of the scales are either false, difficult or uncertain, and some of them have all these faults. In short, the defects of the ordinary flute are false tuning, unequal tone and limited means of execution. . . . The reasons that these sometimes escape notice are, firstly, that many persons have not the gift of correct musical ear, and therefore think the flute perfect; secondly, that many players and composers are skilful in concealing the imperfections of the instrument."

The writer then proceeds to criticise at great length the various improvements effected since the time of Quantz, with all of which, and with their weak points, the reader is already familiar. He objects strongly to the use of many keys, not only on account of the difficulty of using them in rapid passages, and their uncertainty in stopping, but also because the extra holes, being mostly placed in false positions, only imperfectly fulfil the purposes for which they were intended. The weak *e'* and *e'*

caused by the small size of the hole, incur special and justly merited condemnation, as do also the numerous false shakes, and the writer shows that "the so-much-vaunted perfection" of the Tromlitz flutes is greatly exaggerated, although he knows "how to value the services and the knowledge of Mr. Tromlitz and others."

491. The question is then raised, "whether it would not be possible to contrive some change in the construction of the instrument, by means of which all the above-mentioned defects might be removed without introducing new ones in their places." The desiderata for a perfect flute are well and succinctly set forth, and these are said to be "the measuring rod by which the greater or lesser worth of each new invention must be gauged." Then follows a list of the difficulties that beset an inventor, but we are told that these "should not appal us, but urge us on with renewed fire towards the desired goal, and we should have more hope of reaching this if several artists, abjuring all jealousy, would make known their failures and their successes, and in this manner mutually instruct and support one another. . . . Perhaps also," continues the author, "the information concerning my own propositions and experiences, although I am no artist, may be of some use, or may at least be the means of inspiring some happy thought, and inciting others to similar and better experiments and proposals."

492. Various suggestions are offered for the improvement of the instrument, accompanied by some regret that a key for $d\sharp$ is indispensable; allusion is made to certain contrivances for the improvement of the e' and e'' ; objections are raised against the plan of covering the e hole with an open key, chiefly on account of "the artificiality and unsteadiness of such a key." Then ensues a bold proposition to cover the hole with the little finger of the right hand, and to employ the other three fingers of this hand in governing the f , $f\sharp$ and g holes, all these being placed approximately in their correct positions. The four fingers of the right hand being thus occupied, the $d\sharp$ key is to be given to the thumb, and although the writer is aware

of the objections to such a proposal, he can find no means of avoiding the difficulty without sacrificing his pet project of dispensing with all other keys. He considers that giving the $f\sharp$ hole to the thumb, as proposed by Tromlitz (see §484), would cause at least as much difficulty, and that if the $f\sharp$ hole were given to the thumb, as proposed by many, yet greater difficulties would arise, therefore he thinks that the $d\sharp$ key for the thumb of the right hand must be regarded as a necessary evil, to be lessened as much as possible by judicious construction and management.

493. It is proposed to give the $g\sharp$, a , $b\flat$, c and $c\sharp$ holes to the fourth, third, second and first fingers, and the thumb of the left hand. There is no hole for $b\sharp$, and the $g\sharp$ hole is to be placed above its true position in order that the little finger may be able to reach it, consequently it is to be smaller than the other holes. The author persistently strives to dispense with all keys but the one above mentioned, and proposes to use a fork-fingering for $b\sharp$, but he adds that a $b\sharp$ hole, covered by a key, might be employed as a last resource. He would also cover the $g\sharp$ hole with a key if it were found to be inconvenient in practice to close it with the unaided little finger. It is not necessary to follow him through his interesting ramble among the possible adaptations of the ten fingers to the eleven finger-holes, or to notice, at any length, his vacillation as to whether the one fork-fingering, which he seems to have considered indispensable, were better employed for b or for c , and whether or not the bore might be so altered as to improve the tone of the note with the fork-fingering without injuring the others.

494. The bore recommended for the body of the flute is described as being tapered sufficiently to cause the diameter at the open end to be one-third less than that at the upper end. The diameter at this end is to be the same as that of the head-joint, for which the cylindrical form and the usual calibre are to be retained.

The fingering of the two lower octaves is self-evident; that of the third, as given by the author, seems to have been arranged

on no principle whatever, and shows that he was not fully alive to the advantages that his own flute presented. I have not thought this worth transcribing. The writer contends that the fingering is made easier, or at least not more difficult, than that of the ordinary flute, and that change of fingering does not necessarily involve loss of facility, though new fingerings are, of course, more difficult at first, and he thinks that it is incumbent on those who offer objections to the new methods, to show that they are really more difficult than the old.

495. In giving a recapitulation of the advantages that he considers he has gained by his invention, he does not indulge in any extravagant eulogy of it, but lays the good and the bad points fairly, modestly and dispassionately before the reader, and he says: "these are the virtues of my instrument; its faults I have not attempted to hide, and, far from thinking it perfect in every respect, I only submit it to those who understand the subject for criticism and trial. Let them decide whether it is capable of being used, and whether it is fitted for general adoption. My desire is that persons may be induced to take the trouble to examine it from all points; to compare it with other flutes; to improve upon it, and, if it should be necessary, to alter the whole scheme. It has been my special object to *further the study of the construction of the flute; to give an impetus to the spirit of invention with regard to this beautiful instrument, and to combat the opinion that the present flute with keys is capable of no further improvement.*"

"I do not pretend that my invention is alone of its kind, or that it is entirely new, and I will mention some discoveries to which mine presents some points of resemblance. One is by Tromlitz and was announced several years ago, but was only explained in his last work." This invention is described in §§483 to 486. It is fairly criticised by Pottgiesser, who also mentions an account, published in a Hamburg newspaper, of a flute with only nine holes, on which its inventor performed a concerto with remarkable success. No details of this flute appear to have been published, nor is the name of the performer mentioned: it was probably Petersen.

496.

II. FIG. 47.

I.

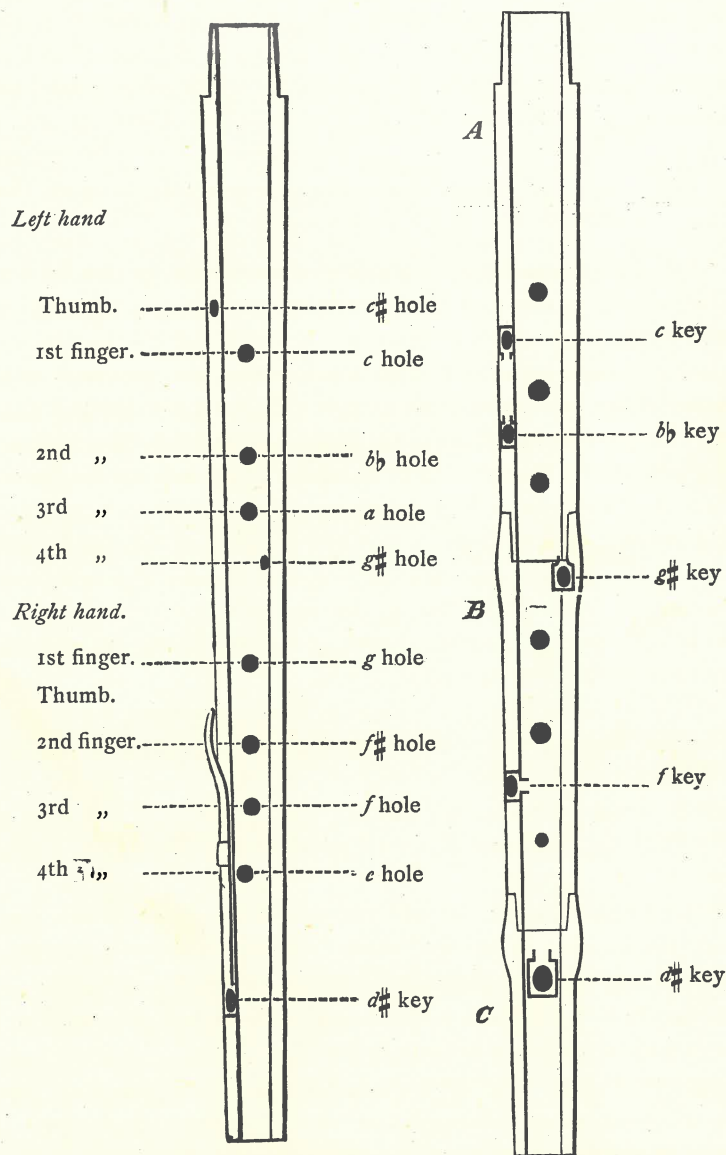


Fig. 47 is a reduced copy of the original engraving, altered only in the lettering, which would otherwise have rendered it unintelligible to most English readers. It will be seen that the flute of Pottgiesser was in two pieces only, these were called the head-piece and the finger-piece. The following explanation is a literal translation:

497. "*Fig. 1* shows the flute of Tromlitz in its present condition. *A* the middle-piece, *B* the heart-piece, *C* the foot-piece.

"The bore decreases from the upper end of the middle-piece; is narrowest at the end of the heart-piece, and then becomes wider again.

"The holes 1 (*c*), 2 (*b*), 3 (*a*) are for the 1st, 2nd and 3rd fingers of the left hand, and 4 (*g*), 5 (*f*), 6 (*e*) are for the 1st, 2nd and 3rd fingers of the right hand. The keys for *c* and *b* are governed by the left hand thumb; the *g* key by the little finger of the left hand, and the *a* key by the little finger of the right hand.

"The *f* key has the position shown, only when it is single. If it is double, it [the hole] lies on the opposite side of the flute, and is governed by the little finger of the left hand, [as well as by the third finger of the right hand.]

"*Fig. II* shows the flute according to my proposed construction. As the head-piece remains unaltered it is not shown. The other portion of the flute consists of one piece only. It differs from the before-mentioned flute:

"(1.) In the bore, which decreases equally towards the open end.

"(2.) In the length. In order to retain the usual pitch, the flute was obliged to be shortened, because the bore is on the whole wider, and the sound is therefore deeper.

"(3.) In the number, position and size of the holes. The drawing renders this sufficiently clear."

498. It may be seen at a glance that this is in one sense an improvement on the ordinary flute, but that the author's determined opposition to the use of more than one key renders the

invention practically useless. The weakest points of the above scheme are the absence of any hole for *b*; the high position, and consequent reduction in size, of the *g* hole; the employment of the right hand thumb for opening the *a* key, and the low position of the *a* hole, nevertheless it must be conceded that there is some merit in Pottgiesser's effort to carry out the idea (first broached by Tromlitz) of applying a system of open finger-holes to the flute, and to improve the positions of those holes generally, which Tromlitz seems to have attempted in two instances only. It should be observed that only one note of Pottgiesser's flute, the *c*, was necessarily veiled.

Ward's statement that he had one of these flutes in his possession was no doubt strictly true, but it is probable that he made the flute himself from the published engraving.

The interesting essay of Dr. Pottgiesser elicited no reply, and seems to have attracted no attention whatever.

499. Laurent's Glass Flutes. "The Long *c* Key," 1806. Through the kindness of Madame Constance Younger (Delevingne), I have been enabled to procure details and drawings of two glass flutes by Laurent (1806), now in the Museum of the Paris *Conservatoire*. I have recently seen these instruments, and I find that they are exquisitely finished. Their silver keys are inlaid with amethysts, and mounted on pillars, also of silver, which are fastened into plates of the same metal: see *fig. 27* §381. One of these flutes, evidently the older, has seven keys, including the "*c* key." It bears no date. The other, which has eight keys and an interchangeable "*petite patte*," is dated 1820. M. Chouquet (1884) states that the first flute of this kind gained for Laurent a silver medal at the French Exhibition of 1806. On both these instruments the *c* key is placed as it generally is at the present time, that is, it extends along the flute, by the side of the *b* key, and it is opened by the first finger of the right hand: see *fig. 51*, §555.

In my young days I played on a flute, made by W. H. Potter, which had been originally furnished with a short *c* key, placed in a line with the *g* key, and intended to be used by the second

finger of the left hand. A long *c''* key, for the first finger of the right hand, had evidently been added subsequently, for the sake of greater convenience in making the shake, *b'-c''*.

In Wragg's *Improved Flute Preceptor* (1806) we find mentioned, and recommended, the eight keys for *c'*, *c''*, *d''*, *f*, *g''*, *bb*, *c''* and the additional, or long, *f* key. The *c''* key was a short one, similar to that described in the last paragraph. This is the earliest indication, that I have been able to discover, of the use of the eight-keyed flute having been general in this country. In a later edition of his book Wragg objects strongly to the long *c''* key, saying that it is liable to injury by coming into contact with the long *f* key when the flute is taken to pieces. The long *f* key was not then made curved to allow the *c''* key to pass under it: see *fig.* 51, §555.

500. A Flute by Monzani, 1807. Mr. Henry W. Carte, the present head of the eminent firm, Rudall, Carte and Co., possesses a very interesting collection of old flutes which he has kindly placed at my disposal for the purposes of this book. The flute here described forms part of that collection; it is branded with the inscription MONZANI, 3 OLD BOND STREET, LONDON, and this, with the aid of *The London Directory*, enables the year of its manufacture to be fixed with certainty. It is made of cocus-wood, and is tipped with silver. It consists of three joints only, and these are united by sliding silver tubes. There is no tuning slide in the head-joint itself. Besides the ordinary eight keys, including the long *c''* key and the long *f* key with duplicate hole, there are an extra *bb* lever for the first finger of the right hand, similar to that of Tromlitz, and two wretched little keys intended to improve the notes *a* and *g*, but which have really made them worse than they would otherwise have been.

501. Some idea of the proportions of the bore may be gained from the following table. The measurements are in inches and decimals of an inch.

Diameter. Inch.		Distance from cork. Inches.
.74	at the cork,	00.00
.74	at a part of the second joint,	05.91
.72	(a sudden contraction.)	05.91
.58	at the lower end of the second joint,	14.06
.58	at the upper end of the third joint,	14.06
.39	at the open end, the smallest part,	24.25

502. The sizes and positions of the finger-holes are as follows. These are the smallest that I have seen on an English flute. The oval mouth-hole measures .40 by .33 inch.

Finger-holes.	Exterior diameters. Inch.	Distance of centre of hole Inches.	from centre of
<i>c''</i> ♯	.26	8.62	Mouth-hole.
<i>c''</i>	.22	0.71	<i>c''</i> ♯ hole.
<i>b</i>	.26	0.70	<i>c''</i> "
<i>bb</i>	.19	0.52	<i>b</i> "
<i>a</i>	.24	0.89	<i>bb</i> "
<i>g''</i> ♯	.18	0.96	<i>a</i> "
<i>g</i>	.25	1.46	<i>g''</i> ♯ "
<i>f</i> ♯	.26	1.32	<i>g</i> "
<i>f</i>	.21	0.64	<i>f</i> ♯ "
<i>e</i>	.21	0.68	<i>f</i> "
<i>d''</i> ♯	.34	2.34	<i>e</i> "
<i>d</i>	.35	1.44	<i>d''</i> ♯ "
<i>c''</i> ♯	.36	1.44	<i>d</i> "
<i>c'</i> (open end)	.39	1.79	<i>c''</i> ♯ "

503. The Writings of Liebeskind. In the *Allgemeine Musikalische Zeitung* for the years 1806, 1807 and 1808, there appeared a series of well-written articles on the flute, by Dr. Johann Heinrich Liebeskind, a distinguished lawyer; an accomplished amateur performer on the flute, and the son of a celebrated professor of that instrument. These articles attracted a great deal of notice in Germany, but, although they undoubtedly contributed largely to the spread of the already existing theoretical knowledge of the flute, they neither aimed at, nor led to, any radical improvement in the instrument, being, in fact, some-

what behind their time. It is, therefore, unnecessary to bestow more than a passing notice upon them.

504. W. H. Potter's Sliding Keys (1808). No less than four patents for inventions intended to improve the flute were granted in the year 1808. The first, dated May 28th, may be dismissed with very few words. The patentee was the well-known "William Henry Potter, of 5 Pemberton Row, Gough Square, in the City of London, Flute Maker." The invention was for the purpose of "giving a sliding motion to the valves by which the holes of German flutes and other wind-instruments (usually stopped by keys with valves) are stopped or opened." This sliding motion was presumably intended to facilitate the production of the barbarism, now happily discarded by flute-players, called the "glide."

505. Townley's Tuning Lever (1808). This patent was dated August 9th. It was granted to "Charles Gostling Townley, of Ramsgate, in the County of Kent, Esquire." The invention is described as "A Key which Regulates the Tone of the Flute, or other Musical Instrument capable of the Improvement, by causing the Bore of it to lengthen or contract at Pleasure." The object was effected by means of two levers which were moved by the thumb of the left hand. These levers acted on the tuning slide, and could be used during performance. They never came into vogue, though they were more than once re-invented in Germany.

506. Townley's Key for the Improvement of the *d'* (1808). Another patent was granted, on November 26th, to the same C. G. Townley, which includes, amongst other contrivances and re-inventions not worth notice, "an additional key covering a small hole, which sharpens low *d* a quarter of a note or thereabouts, and is used in playing low *d* soft, . . . that note being generally much too flat on the flute except it is forced."

It may be well to explain that the *d'* of the flute of this period was frequently so flat that it was not at all uncommon for the interval *d', e'* to approach very closely to a minor third. Of course it was possible to play the note in tune, but it was exceedingly difficult. The reason for the misplacement of the *d'* hole was the obstinacy with which performers adhered to the

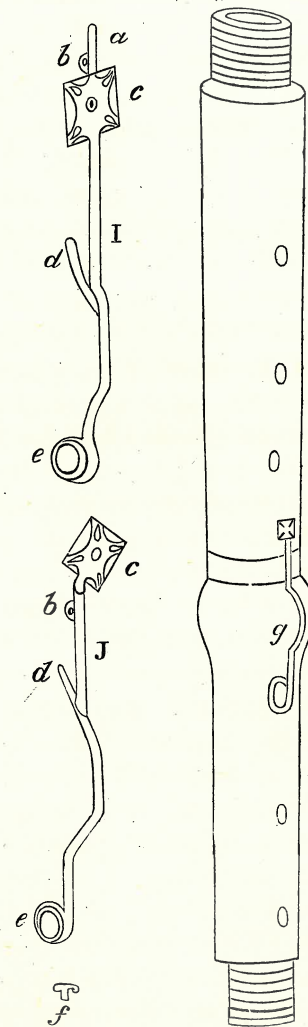
fingering of the upper notes of the one-keyed flute, some of which, especially the *f'''#*, were improved by the false position of this hole.

507. Townley's Mouth-piece (1808). The same patent includes the invention of a mouth-piece to be attached to the flute, for the purpose of converting it into a whistle. It appears, from the specification, that this was not the first contrivance of the kind, for it is alleged that "the present flute mouth-pieces may be said to be wholly useless," a criticism which might with perfect justice be passed upon the invention under discussion. In §534 will be found a representation of a somewhat improved form of mouth-piece.

508. Nolan's Patent. The "Open *g#* Key" (1808). The fourth of these patents was granted on November 26th to "The Rev. Frederick Nolan, of Stratford, near Colchester, in the County of Essex, Clerk." The first, second, fourth and fifth parts of the specification are descriptions of some ingenious, though rather clumsy and quite useless, modifications of the ancient custom of plugging certain holes which were only required for occasional use: see §305.

509. The third part of this specification possesses sufficient interest to justify its being reproduced, with copies of the original

FIG. 48.
Nolan's open *g#* Key.



drawings to which it refers. Parts of the latter will be observed to be curiously out of perspective, but I have thought it better not to alter them.

510. "In order to bring the acute semitone under the modulation of the finger which plays the regular diatonick note, let a perforated key (Fig. [48] I) be placed over a hole bored to produce the required semitone between the proper hole and the hole next above it, of the following construction:—Let it be made of a proper length to cover both holes, viz., that sounding the full tone with its touch (*e*), and that sounding the semitone with its valve (*c*); let it be so bored through the touch (*e*) as to permit the full tone to pass freely through the perforation (*e*), or to be completely stopped by the finger which presses the key down; let it have its hinge (*b*) behind the valve (*c*), its springs (*d*) between the perforation and the valve, and let it be furnished with a projecting tongue (*a*) behind the hinge, to prevent the spring from throwing the touch too high. For the purposes of modulation there should be otherwise a catch (*f*) placed behind the touch, which, by turning on a pin or pivot, may fasten down the key when it is fixed to the instrument (Fig. [48] *g*) in a box or ball properly placed for the hinge. In place of this key a jointed key (Fig. [48] *J*) of the same kind as those used on the German flute and hautbois may be used when there is sufficient distance between the holes sounding the full tone and semitone, to admit of a double lever's being employed. This key should be perforated, as well as the former, and occasionally fastened down by means of a catch. Hence, on loosing the catch, the acute semitone may be produced by the same fingering as the full tone. The accidental of the former is produced by pressing the key towards the valve, and permitting the sound to come through the perforation; the accidental to the latter is produced by touching back the catch, and allowing the key to spring up. This contrivance is principally of use in producing $g\sharp$ on the flute and such instruments."

511. The above is a representation of possibly the first con-

trivance for closing an open key, and an uncovered hole by the same finger. It should be particularly noted that there is a $g\sharp$ hole provided with an open key, and that the closing of this open key is effected by means of a perforated one which is in the form of a ring. It is possible that the $g\sharp$ key which Pottgiesser proposed (§493) may not have been intended to be open, but there is every reason to believe that it was.

512. Thomas Scott's Patent (1810). A patent, dated March 12th, 1810, was granted to Thomas Scott of Holborn, Musical Instrument Maker, for certain contrivances which were intended to facilitate the performance of music in keys then considered difficult.

The means proposed were partitions, or diaphragms, placed longitudinally within the bore of the flute. By changing the positions of these the notes were to be raised or lowered in pitch. The patent also embraced a scheme for closing or opening certain holes by means of collars, somewhat after the manner employed on the ancient instruments. It is not necessary to dilate on the futility of such inventions.

513. Mac Gregor's "Bass Flute" (1810). "Malcolm Mac Gregor, of Bell Yard, Carey Street, in the County of Middlesex, Musical Instrument Maker," obtained a patent, on June 19th, 1810, for a bass flute which closely resembled that made by Delusse about the middle of the previous century: see §450.

The following are the particulars of one of these flutes, kindly lent to me by Mr. Henry W. Carte. The *London Directory* proves this instrument to have been made between the years of 1812 and 1816, but it is constructed very nearly in accordance with the terms of the specification of 1810.

The main tube of the flute is of box-wood; the tips are of ivory; the curved tube and the keys are of brass. In addition to five keys, which resemble those on the flute of Delusse, there are three closed keys for $f\sharp$, $g\sharp$ and $b\flat$. The tone in the first octave is rather full; that of the second and third octaves abominable. The lower attendant sounds are especially

276 MEASUREMENTS OF MAC GREGOR'S BASS FLUTE.

obtrusive in the second octave. The flute bears the branded inscription: "WIGLEY AND MC GREGOR, PATENTEES, 151 STRAND, LONDON," surmounted by the royal arms. Each joint bears the number, 2.

The specification leads to the conclusion that there was originally a screw-stopper to this flute, but the present stopper has no screw, and consists of an ingot of solid gun-metal. This has not the ordinary plane surface next to the mouth-hole, but it is deeply concave, somewhat after the fashion of a parabolic light-reflector; a plan that has often been tried and been found to possess no advantage.

514. If the flute were furnished with an ordinary stopper, correctly placed, the interior lengths of the joints, exclusive of the sockets, would be as follows:

	Inches.
Upper part of the head-joint, from the stopper, -	5.87
Curved tube joining the two portions of the head-joint, mean measurement, - - -	5.60
Lower part of the head-joint, - - -	4.00
Second joint, - - - - -	13.30
Third joint, - - - - -	9.65
Foot-joint, - - - - -	5.10
	—
Entire interior length, - - - - -	<u>43.52</u>

515. The dimensions of the bore are as follows:

Diameter.	Distance from cork.
<i>Inch.</i>	<i>Inches.</i>
1.07 at the cork, - - - - -	00.00
1.07 at a part of the head, - - - - -	13.17
1.00 at the lower end of the head, - - - - -	15.47
1.00 at the upper end of the second joint, - - - - -	15.47
0.77 at the lower end of the second joint, - - - - -	28.77
0.79 at the upper end of the third joint, - - - - -	28.77
0.67 at the lower end of the third joint, - - - - -	38.42
0.67 at the upper end of the foot, - - - - -	38.42
0.70 at the open end, - - - - -	43.52

The *a'*, when all the joints are pushed closely in, has exactly 452 vibrations.

The distances between the holes are, roughly, double those on an ordinary concert-flute.

516. In MacGregor's specification there is a description, with a drawing, of an undesirable modification of the head-joint. The suggestion is that the double tube should be cut in a solid block of wood of oval exterior. The open keys are shown as jointed levers of the first order, instead of the simple levers of the second order which belong to the flute just described. There is also a proposal for a pad, instead of the usual piece of leather, on the flap of the key. It is described as "a pad or valve which is applicable to all kinds of keys used to wind-instruments, whether open or shut; it is composed of a small plate and screw for the purpose of fixing it into a cavity. In the flap beneath the plate is to be placed a bit of sponge, which sponge is to be covered with fine thin leather, so as to be air-tight, and to form, as it were, the point of a finger; by which means the hole is shut more effectually, and with less pressure, than by keys now in use. Perhaps India-rubber or other elastic substances may produce the same effect, but I prefer sponge."

517. **The Metal Flutes of George Miller (1810).** A patent for the "method of making wind-instruments, commonly called military fifes, of substances never before used for that purpose" was granted to George Miller on October 1st, 1810. This patent has been mentioned in §320, and little remains to be said on the subject, but it is important to note that although "military fifes" only are mentioned in the title of the specification, there is a description of the process of making superior instruments for "joining in military bands." These are "made in two joints; the lower ones are tapered by being soldered and hammered hard on steel triblets or mandrels."

518. **A Flute by William Henry Potter, 1810 circa.** The maker of this flute was the son of Richard Potter, the patentee mentioned in §473. He was for some years in partnership with

his father, but he afterwards carried on the business alone for about thirty years, and during the whole of that time he was considered one of the best flute-makers in England. The flute about to be described, which was kindly lent to me by my friend Mr. George W. Pearse, was made about the year 1810. The head-joint is thus branded: "PATENT. WILLM. HENY. POTTER. JOHNSON'S COURT, FLEET STREET, LONDON." It is a good specimen of its kind, in excellent preservation, and its tone is of charming quality, though neither powerful nor equal. The intonation is not so false as might have been expected.

This instrument is of box-wood, with ivory tips and cap. There are three joints besides the head; this has the graduated tuning slide and the screw-cork of Richard Potter's patent (1785). The six silver keys, on knobs, have plugs of soft metal which fit into counter-sunk holes that are not bushed with metal, but the stopping is nevertheless perfect.

The length of the bore, from the cork, is exactly twenty-four inches. The cylindrical part has a length of 5.75 inches and a diameter of .75 inch. At 5.75 inches from the cork, the contraction begins, and it continues, with a tolerably regular declination, for a distance of 16.95 inches. At this place the diameter is .4 inch. For the remaining distance, 1.3 inch, the bore slightly expands, being .43 inch at the open end.

The external diameters of the oval mouth-hole, which is much undercut, are .45 and .4 inch respectively.

519. The sizes and positions of the finger-holes are given in the following table, in inches and decimals of an inch.

Finger-holes.	Exterior diameters.	Distance of centre of hole	from centre of
c ^{##}	.27	8.44	Mouth-hole.
b ^{##}	.30	1.45	c ^{##} hole
b ^b	.24	0.64	b "
a ^{##}	.26	0.71	b ^b "
g ^{##}	.22	0.89	a "
g ^a	.28	1.48	g ^{##} "

Finger-holes.	Exterior diameters.	Distance of centre of hole	from centre of
f ^{##}	.28	1.35	g hole
f ^a	.26	0.71	f ^{##} "
e ^{##}	.20	0.67	f ^a "
d ^{##}	.35	2.28	e "
d ^a	.34	1.39	d ^{##} "
c ^{##}	.34	1.39	d "
c ^a (open end)	.43	1.85	c ^{##} "

520. **The Re-enlargement of the Finger-holes.** Early in the present century the father of the famous Charles Nicholson improved the flute by greatly enlarging the finger-holes. This was, in fact, a restoration of the large holes of the time of Mersenne, and the increase of size was perfectly justifiable, as the introduction of the extra keys had rendered the greater part of the fork-fingerings, for the notes of the first and second octaves, really unnecessary, and therefore there was no longer any occasion for spoiling the tone of the flute by the retention of the small holes, although the reduction of size had served a useful purpose in earlier times, as has been explained. The increase in the diameter of the holes was strongly disapproved on the Continent, both by professors and manufacturers. Further allusion to the large-holed flutes of Nicholson will be found in §§ 536 to 540.

521. **Carl Maria von Weber's Account of a new Flute (1811).** The letter, here translated, appeared in the *Allgemeine Musikalische Zeitung* for the year 1811. It has an important bearing on the history of the flute, as will hereafter be seen.

"Herr J. Nepomuk Capeller, a member of the Court-orchestra of Munich, has perfected the flute by a most ingenious invention which leaves scarcely anything to be desired. The advantages gained by his improvements are facility in altering the pitch without deterioration of the intonation, and great improvement in the shakes: thus the principal defects of the flute are removed.

"Herr Capeller took his first idea from an earlier invention,

the tuning slide in the head-joint, to which Tromlitz has already drawn attention, and with which this invention must not be confused, for although the instrument could be altered in pitch by means of the slide, it lost its pure intonation. Herr Capeller's new flute consists of three pieces only. The two ordinary middle pieces are combined, and, in order that this middle joint may not be too long in proportion to the others, the length of the latter is somewhat increased while the middle is shortened, so that the entire length of the flute is the same as that of the ordinary flutes which are provided with the low *c* key.

"This flute has nine keys. The *g*[♯] key can be opened from both sides, the lower lever being governed either by the first or the second finger of the right hand, which gives great facility in making the shake *f*[♯] and *g*[♯]. The newly invented *d*^{''} key, used by the first finger of the right hand, is intended for the shakes on *c*[♯] with *d*, but it serves also for the shakes on *b*[♯] with *c*[♯] and on *d*^{'''} with *e*^{'''}. The low *c* key is so arranged that one can slur easily from *c*[♯] to *c*^{''}, which was not possible with the ordinary *c* key. The other keys are as generally constructed, and with them all the notes and shakes can be produced in tune and with facility.

522. "The most important and interesting part of this flute is the mechanism for tuning. In order that this might be as perfect as possible, Herr Capeller has adopted a moveable mouth-hole. This is placed in an oval plate of gold which is arranged in an elegant manner on the head of the flute. Not only the mouth-piece, but also the cork, can be moved at will by means of a screw. By this arrangement the pitch of the whole instrument can be rapidly altered, without any detriment, on the whole, to the general intonation.

"The great advantages of these improvements are so plain that it is unnecessary to say anything further in their praise, and the writer only has to remark that these flutes are made, not by a musical instrument maker, but by an artistic turner named Fiegel, with such good results that the flute is on a par with

those of the best instrument makers, as regards the neatness and the beauty of the workmanship.

"The price is not higher than that of an ordinary good flute, and Herr Capeller will be good enough to obtain one of the new flutes for anyone who desires to have one."

523. To this letter are appended the following remarks by the editor of the journal: "We have on several occasions printed information concerning the improvement of the flute, and we have now received another communication, also from a worthy musician, on the same subject. According to this, Mr. J. C. F. Schneider, the instrument maker in Wesel, has invented a flute with two keys, which has all the requisite capabilities and is, besides, more perfect than the ordinary flute with seven keys, for it gives all the notes from *d*['] to *b*^{'''}_b (not excepting the *e*['] and the *e*^{''}) with equal strength and clearness, and perfectly in tune. This flute affords greater and more equal facility than the seven-keyed flute, for playing in all the keys, and it is furnished with a contrivance for instantly raising or lowering the pitch by more or less pressure on a key, so that the natural tendency of the sound to rise in a *forte* and to sink in a *piano* can be overcome at will. [This seems to have been a contrivance similar to that of Townley, described in §502.] The fingering on this flute is not very different to that of the ordinary flute."

524. These articles are followed by a letter from Heinrich Grenser, a noted wind-instrument maker of Dresden, (1811) who condemns the oft-repeated attempts to persuade a confiding public to buy new flutes that will not bear the scrutiny of those who are competent to form an opinion on them. Many of these new discoveries, he truly says, turn out to be old discarded failures, and he seems to consider all of them worse than useless.

525. **Tebaldo Monzani's Patent (1812).** The only invention of any value, mentioned in Monzani's specification, is the French pin-and-socket-joint, with cork-covering for the pin, and silver lining for the socket, as described in §324. Monzani suggests

the manifestly inappropriate materials, leather and cloth, as substitutes for cork.

The other contrivances specified are: The making of the third joint and the foot in one piece, which had been done years before; "a small hole (placed close to the usual one) for the purpose of rendering those notes sharper which are too flat, and is used by withdrawing the . . . finger from it," and "A nob [sic] on each side of the embouchure for the purpose of keeping the lips of the performer in a proper position to produce the lower notes with facility." An old ivory flute provided with projections of this kind was shown at the "Inventions" Exhibition in 1885.

Monzani's flute was at this time furnished with nine square-flapped keys, but there were no duplicate holes. The head-joint had no tuning slide, alteration of pitch being effected at the joint, but though the pin was chamfered at the end, there was nothing to prevent the formation of a cavity in the socket when the pin was drawn out.

526. Monzani and Hill, or Monzani and Co., by which titles the firm was styled after 1807, were eminently successful in a commercial sense, and their flutes were well and sometimes elegantly finished, but, regarded as instruments of music, they cannot be said to have been at any time better than the less pretentious flutes of the Potters, from which they differed little except in appearance.

Although this firm ceased for a time to make the metal slide in the head-joint, they soon replaced it, but they continued to construct the second joint with a socket at its upper end, the pin being, of course, on the head-joint. They invariably made their keys with flaps and leathers. The very small holes of their flute of 1807 they afterwards slightly increased in size, but they never adopted the large holes of the Nicholsons.

527. James Wood's Patent (1814), dated "the First day of April," was merely an adaptation of the ordinary double sliding tube of metal to all the joints of the flute. In the description,

transcribed below, the patentee betrays either his want of knowledge or his faith in the credulity of the public.

"My said Invention of improvements extends to the marking or dividing the outside of each joint into spaces marked $\sharp \natural b$, so that the marked spaces on each joint shall correspond, assimilate, and act with each other when it is required to make the instrument flatter or sharper by pulling in or out the double sliding cylindrical tubes hereafter described, as occasion may require, so that the flute can be made considerably sharper than concert pitch, or flattened nearly half a note if necessary. And my Invention of improvements farther extends to the keeping every part of the instrument to its proper bearings throughout, how much soever the flute at the joints formed by and for the insertion, application, adaption, working, sliding, or passing over or into each other of the double cylindrical tubes hereafter described shall be extended, provided that the marked spaces on the respective tubes at each joint be made to correspond or agree with each other, by which means every part of the instrument bears a correct analogy and the same just and harmonical proportion as when tuned to concert pitch, both with respect to the double and hitherto unknown advantage of retaining its good quality of tone and keeping the notes A, G, and the lower D, as well as every other part of the instrument, perfectly in tune though flattened nearly half a note, as before mentioned."

528. Flutes for One-handed Persons, 1815 circa. So great was the esteem in which the flute was held, in the early part of the present century, that many persons insisted on playing on the instrument in spite of what might have been accounted invincible physical obstacles. In the *Allgemeine Musikalische Zeitung* for 1815, page 265, there is a description of a flute which was intended for those who had lost the right hand, and which was invented by "a worthy instrument maker and an excellent musician of Carlsruhe, named Ehrhard, first hautboy-player at the Court Chapel." This flute, although fingered by the left hand only, was of the ordinary size and compass. The lower end was supported by a moveable fork attached to a music-desk.

There were the usual seven finger-holes of a one-keyed flute. The first, second and third fingers stopped the $c\sharp$, b and a holes. The g and $f\sharp$ holes were provided with open keys which could be closed, together or separately, by the thumb; the e hole had also an open key which could be closed by the little finger, and the closed $d\sharp$ key was so contrived that it also could be reached by the same finger.

529. The flute of Colonel Rebsomen, an accomplished and well-known amateur, who flourished in France at this time, was a far superior instrument to Ehrhard's. It was fingered by the right hand only, the Colonel having lost his left arm, and was supported on a stand that was fixed to the corner of a table. It had not only all the finger-holes of the common seven-keyed flute, but also the newly invented shake-key of Capeller, described in §§ 521-2, and a hole with an open key for the production of the low b , an extension of the compass of the flute then coming into fashion.

Rebsomen designed the mechanism of his flute himself, and Cornelius Ward, then foreman to Monzani and Hill, was the actual maker. Ward showed me the original model for this flute, which he had made under the inventor's personal direction.

The instrument being artificially supported, there was no difficulty in using the thumb for fingering, but the most ingenious feature in the arrangement was the employment of the second joints of the first, second and third fingers, so that each of these fingers controlled the hole usually appropriated to it, as well as a key behind the hole. There was no attempt to improve the positions of the holes, which were placed as on the ordinary flutes of the time. All the keys were on knobs, the appearance of the flute was therefore inelegant, but the machinery was admirably contrived and its action all that could be desired.

Ward informed me that Rebsomen had considerable execution, and that no one would have discovered, from his performance, that he had less than the usual number of fingers. Cöche (1838A) relates how the Colonel made flutes with his one hand, and he pays the following well-merited tribute to his ingenuity and skill:

"I must render justice to the extraordinary talent and singular perseverance with which Colonel Rebsomen first made utensils to replace the left arm that he had lost, and then, by their aid, constructed special instruments by means of which he produced his admirable flute."

530. Walking-stick-flutes. Amongst the numerous curious relics possessed by Cornelius Ward, were some flutes disguised as walking-sticks. One stick consisted of two small flutes placed in line and so arranged that two persons walking arm-in-arm could play duets upon them. Each of these flutes had, besides the usual six open finger-holes, four wooden keys fashioned in imitation of the stumps of twigs. There are several "*canne-flûtes*" in the Museum of the Paris *Conservatoire*.

531. An Eight-keyed Flute by Louis Drouet, 1818 *circa*. Drouet was established as a flute manufacturer in Conduit Street, London, for about a year only, his venture proving unsuccessful. The flutes were made, under his direction, by Cornelius Ward. The specimen now before me is from the collection of Mr. Henry Carte. It possesses only the following points of interest: The bore at the upper end of the second joint has a diameter of only .7 inch; the largest finger-hole, that for $f\sharp$, has a diameter of .34 inch; all the keys are mounted on knobs, and have hemispherical cups with stuffed leather pads; the arrangement of the keys of the foot-joint is peculiarly complicated and inconvenient. Drouet neither used nor recommended more than eight keys.

532. "Flûtes d'Amour" by Clementi and Co., 1819, and Oberlender. The *flûte d'amour* by Clementi differs very slightly from that by Oberlender, which is of earlier but uncertain date. Both these instruments are in the collection of Mr. Zoeller. The first mentioned is of box-wood, tipped and capped with ivory; it consists of three pieces only. The pin of the upper joint forms part of the head, which is provided with the ordinary screw-cork. The ivory tips of the two sockets are covered with silver, and there are four square-flapped silver keys with knobs.

Blown at mean pitch, the a' has 361 vibrations. This was, no

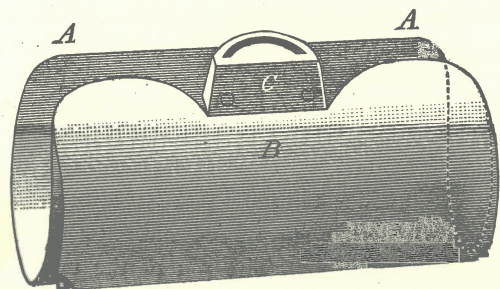
doubt, intended for a meantone minor *third* below the *a'* of the concert-flute of the period, the actual sound of the note fingered as *d'*, being *b♯*. The length of the bore, measured from the cork, is 27.15 inches. The interior diameter of the head is .77 inch.

533. The chief points of difference in the flute of Oberlender are as follows: It has four joints; no tips; no screw to the cork; only one key (which is of brass); its length from the cork is 27.28 inches; the interior diameter of the head is .78 inch, and the *a* and *e* holes are bored obliquely, so as to increase their distance from the mouth-hole, on the inside of the tube, without causing undue stretching of the fingers in covering them.

The two flutes differ very little in pitch. The *a'* (*f'♯* in sound) of the older one has 360 vibrations.

534. W. Wheatstone's Mouthpiece, 1820. My friend and pupil, Mr. George W. Pearse, has kindly procured for me a flute mouth-piece made by W. Wheatstone in 1820, and bearing the inscription: "PATENT. W. WHEATSTONE, 128, PALL MALL." It is constructed chiefly of copper, plated with silver, and is lined with leather. The advantages that it possesses over the mouth-piece of Townley, described in §507, are very trifling.

FIG. 49.

Wheatstone's Mouth-piece.

- A A.* Curved plate for fitting on to the head-joint.
B. Curved spring-plate for holding the mouth-piece.
C. Ivory mouth-piece with curved aperture for the passage of the breath.

The tone produced by the aid of this apparatus is poor and unequal, and the power of improving the false notes of the flute of this period is almost destroyed by its employment, although the spring-plate to which the mouth-piece is attached affords some facilities for modifying the tone and the pitch. In this respect it was a slight improvement on Townley's contrivance, but to attach any kind of mouth-piece to the flute tends to degrade the instrument, and to cause the sacrifice of one of its most delightful charms, flexibility of tone.

535. Rudall and Rose. In 1820 the late George Rudall was established in London as a professor of the flute, and Willis, then considered an excellent maker, was constructing flutes under his direction. These were the first instruments marked with the name which has been for so many years a household word amongst flute-players of all nations.

About the year 1821, George Rudall entered into partnership with John Mitchell Rose, a young flute-maker of Edinburgh, and the firm began the manufacture of flutes at 11 Tavistock Street, Covent Garden. The boring of the tubes and the cutting of the holes, the most important and delicate operations connected with flute-making, were invariably executed by Rose, but always under the superintendence of Rudall, whose correct musical ear and consummate taste, ably seconded by the untiring energy and perseverance of his skilful partner, caused the flutes of this firm to gain and to maintain a European reputation.

Rudall and Rose never restricted their efforts by constructing only one pattern of flutes; on the contrary, they made variety a special feature of their manufacture, but whether their flutes were made with large, medium, or small holes, all were the best of their kind.

536. The Flutes of Charles Nicholson, 1822. About this time there arose in England a veritable rage for the large-holed flutes of the renowned Nicholson, then in the zenith of his popularity. Those branded with the inscription "*C. Nicholson's Improved*" were manufactured by Thomas Prowse, the elder,

and sold by Clementi and Co. of 26 Cheapside, but the large-holed flutes of Rudall and Rose were superior to these in intonation, tone and workmanship. Most of the best English players adopted flutes of this pattern: in an advertisement, printed in *The Quarterly Musical Magazine and Review* for the above-named year, it is stated that "during the last few years they have passed into the hands of upwards of ONE THOUSAND professors and amateurs of the first celebrity." This was in allusion to the flutes sold by Clementi and Co. alone.

Most of these flutes were made of cocus-wood. Nicholson for his own use, had the wood excavated for the reception of the first joint of the left hand fore-finger, and he had also an excavation, lined with shark-skin, to receive the point of the right hand thumb. At the part of the third joint of the flute surrounding and between the *g* and *f* \sharp holes, the surface of the wood was often made flat. It was thought that this facilitated the covering of the large holes. The mouth-hole was sometimes bushed with ivory in order to preserve the sharpness of its edge. The metal-lined head-joint was always furnished with the tuning slide and the screw-cork. It was made much thinner than the head-joints of earlier manufacture, particularly at the part surrounding the mouth-hole, and it was often disfigured by rings, turned in the substance of the wood, similar to those on the legs of an old-fashioned chair. Monzani afterwards rivalled this absurdity by having the head-joint fluted like the shaft of an Ionic column.

537. Though Nicholson, and some of his most devoted followers, abjured the use of the long *f* key, it was generally placed on the flutes that bore his name, in addition to the other seven of the then common eight-keyed flute. The last flute on which he played, his favourite instrument, had eight keys. The best of these flutes had cupped keys with stuffed pads of kid-leather. The *c* \sharp and *d* holes, on the flutes sold by Clementi, were generally lined with silver tubes, and closed by metal plugs similar to those made by the Potters. Nicholson had a strong, though unfounded, objection to the plates then coming

into vogue. Sometimes all the keys had cups and pads, but on the cheaper flutes they had the old square flaps and leathers.

538. The lengths of the joints and the dimensions of the bore of a good specimen of these flutes are given below. The bore of Clementi's head-joints was often .01 inch narrower.

Length of joint exclusive of socket. Inches.		Diameter of bore. Inch.
5.86	-	Head-joint from the cork, - .74
		Second joint, upper end, - .74
8.18	-	" " , lower end, - .60
		Third joint, upper end, - .60
4.41	-	" " , lower end, - .50
		Foot-joint, upper end, - .50
5.15	-	" " , open end, - .45
<u>23.60</u>	-	Total length from the cork.

There is a slight enlargement of the bore at the open end.

539. The holes were extremely unequal in size, as the following table shows, but it should be noticed that every very small hole had a larger one next below it, and the reader is aware that this arrangement would tend considerably towards the equalisation of the tone. The excessive sharpness of *e'* and *e''* was somewhat reduced by the hole being bored obliquely, as had been done on Oberlender's *flûte d'amour*, but the necessary consequence of the improvement of these notes was the deterioration of *a'''*, as may be seen on reference to the analyses of the fingering of the earlier flutes. Nicholson made frequent use of the unassisted harmonics: these were much improved by the increase in the size of the holes.

The mouth-hole was always oval, and generally very large. That of the flute now before me, measures .48 by .43 inch, but sometimes this size was greatly exceeded.

540. The sizes and positions of the finger-holes of the flute

under examination, which was kindly lent to me by Messrs. Keith, Prowse and Co., are given below, but sometimes the holes, particularly those for $f\sharp$ and $b\flat$, were larger than these.

Finger-holes.	Exterior diameters. <i>Inch.</i>	Distance of centre of hole <i>Inches.</i>	from centre of
$c\sharp$	.28	8.55	Mouth-hole.
$c\flat$	.24	.70	$c\sharp$ hole.
$b\flat$	.38	.72	$c\flat$ "
$b\sharp$	.19	.65	$b\flat$ "
$a\flat$	.28	.70	$b\sharp$ "
$a\sharp$	.18	.95	$a\flat$ "
$g\flat$	.32	1.47	$g\sharp$ "
$f\flat$	.42	1.30	$g\flat$ "
$f\sharp$	.30	.69	$f\flat$ "
$e\flat$	.22	.66	$f\sharp$ "
$e\sharp$	.46	2.25	$e\flat$ "
$d\flat$	.44	1.22	$e\sharp$ "
$c\sharp$	.40	1.42	$d\flat$ "
$c\flat$ (open end)	.45	1.62	$c\sharp$ "

541. Petersen's Flute. The following account of a new flute appeared in *The Harmonicon* of 1823, and was copied, almost verbatim, in the *Biographical Dictionary of Musicians* (1827). I have been unable to find the original article, which was no doubt in a Hamburg periodical.

"M. Petersen, an eminent professor on the flute, resident at Hamburg, has, after much patient investigation and a variety of trials, been so successful as to invent a piece of mechanism, which, from its effect and simplicity, is equally valuable and praiseworthy. It is a small lever, one inch in length, which can easily be moved by the thumb of the left hand. By means of this, the pitch of the flute is in an instant raised or depressed the eighth of a tone, and, while playing, the *crescendo* and *decrescendo* are maintained perfectly pure. With the assistance of a small fine-wormed screw, which from its effect is called the *pitch-screw*, the flute may be tuned with very little trouble, and without disturbing the effect of the lever. The whole arrange-

ment is in the highest degree simple, and, with respect to its construction and duration, is far preferable to the key.

"M. Petersen adds, that the knobs, or projections, which are necessary to receive the metal pins of the keys, are injurious to the tone of the flute; that the pins will necessarily give, in course of time and friction; and that the stoppers, being thus disarranged, will yield the tone with less purity. In his flute, the two lower pieces are united into one; the middle-piece has but a very trifling projection, and is not to be separated from the mechanism above described, which is affixed to both parts. Next comes the head-piece, which is free from all metal, and only four inches in length, on which is the mouth-hole. This is affixed in the same manner as the mouth-piece of the clarinet.

"By means of these improvements, M. Petersen's flute has attained a degree of perfection unknown on this instrument before."

It is almost needless to add that none of these vaunted "improvements" ever came into general use.

542. Dr. Pottgiesser's Second Effort to improve the flute, (1824). The anonymous essay, published in 1803, was followed, after the lapse of twenty-one years, by another communication to the *Allgemeine Musikalische Zeitung* from the same pen, and signed "H. W. Pottgiesser, M. Dr." After alluding to his former experiments, expressing his disappointment that his article had attracted no notice, and explaining that his long silence was due to circumstances which had nearly severed him from all connection with music, the author relates that two years before the time of his writing renewed leisure had enabled him to return to his old favourite, the flute, and he says: "I then found the instrument provided with keys to superfluity. These were much more elegant and effective than before, though nothing had been gained in purity of intonation, and but little in equality of tone. The notes e , f , $f\sharp$ and c'' were still faulty, while new difficulties had arisen on account of the increased number of the keys."

The author says that he was more than ever convinced that

the entire system of the flute required radical change, and he therefore resolved to begin a new series of experiments; in the end he invented another new flute.

543. This flute is recommended to be made of ebony. It is in two pieces only, the "head-piece" and the "finger-piece," and it is mounted with ivory. The head is furnished with the usual screw-cork.

The bore does not differ materially from that of the ordinary "conical" flute of the time.

All the finger-holes, but those for $c''\sharp$ and d' , are of equal size, whether open or covered, an improvement of supreme importance, their diameter being .25 English inch. The $c''\sharp$ and d' holes have a diameter of .31 inch. The distances of the holes are given, but they are not sufficiently correct to make it worth while to reduce them to English measure for insertion here.

The holes under the keys are bushed, or lined, with metal, and the pads are of cork. The common wooden knobs have been discarded, and boxes of metal, screwed to the flute, are used instead. The touches of the thumb-keys, it is suggested, may be furnished with rollers, if required, for convenience in sliding the thumb from one to the other.

544. The following short description of the fingering of this flute will be sufficient to show its impracticability.

The $c''\sharp$, b , $b\flat$ and a holes are closed by the four fingers of the left hand; the g , $f\sharp$, f and e holes by the four fingers of the right hand. The c'' hole has the ordinary long closed key for the right hand first finger. For $g\sharp$ and $d\sharp$ there are long closed keys, both to be opened by the left hand thumb, and there is an extra arm by means of which the $d\sharp$ key can be opened by the right hand thumb. The stem of this key consists of three levers of the first order placed end to end.

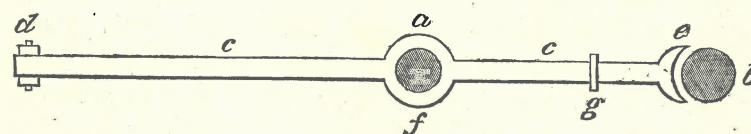
The keys for covering the $c''\sharp$ and d' holes work on axles placed longitudinally. They are closed by means of long levers governed by the right hand thumb. The mechanism of these keys is ill-contrived and curiously complicated.

Provision is made for the shake-key of Capeller, described in

§518. If required, it is suggested that it can be given to the right hand first finger.

An elaborate drawing, to scale, accompanies the treatise: the only part of it that I have thought worth reproducing shows an ingenious contrivance for altering the size of the $c''\sharp$ hole, by means of a perforated key, which is worthy of particular notice.

FIG. 50.

Pottgiesser's Ring-and-crescent-key.

- a. The $c''\sharp$ hole.
- b. The $b\flat$ hole.
- c. c. A bar of metal, with a spring at d.
- d. A hinge on which the bar works.
- e. The crescent-shaped extremity of c c, which is pressed down by the finger when the b hole is closed.
- f. A ring which forms part of c c, and partially closes the $c''\sharp$ hole, (a) when e is pressed down. The ring is provided with a pad.
- g. A kind of staple to keep the bar c c in its place, and prevent its rising too high.

The chief advantages effected by this key are the sharpening of the $c''\sharp$ and the flattening of the "fork" $c''\flat$.

545. Apart from the equalisation of the holes in size, this paper is exceedingly disappointing, and it by no means bears out the promise of the former one, in fact, Pottgiesser seems to have expended an immense amount of unproductive labour on an undertaking which he was unable to carry to anything like a successful issue. It should, however, be especially noted that although he appears to have abandoned his attempt to contrive

a rational system of open finger-holes, he still continues to strive to obtain their true positions, and refuses to be bound by the old tradition, that the convenience of the fingers must be the measure by which the positions of the holes shall be decided.

An account of this flute, with a drawing of it, was also sent to a Berlin newspaper, and elicited some remarks from a certain "*Herr Dr. B.*", but nothing more. The instrument itself was deposited in the office of the old firm of Breitkopf and Härtel at Leipsic, where it was seen and examined by Karl Grenser, the principal flute-player of that town, and the nephew of Heinrich Grenser of Dresden, the rival of Tromlitz.

546. Karl Grenser wrote a lengthy criticism on Pottgiesser's flute, which appeared in No. 24 of the *Zeitung* (1824), and of which the following is a condensation:

Grenser says that when Dr. Pottgiesser's treatise appeared in 1803, people were silent because they could form no opinion upon the new instrument without seeing it, but the latest phase of the invention being open to inspection, he offers some remarks to those who are interested in such matters. He considers that had not the Doctor been so unfortunate as to be acquainted only with ill-constructed flutes, and had he known how to use the keys that he condemned as superfluous, he would not have been tempted to waste so much time in the endeavour to improve an almost perfect instrument. Grenser launches out into extravagant praises of the flutes made by his uncle Heinrich, and asserts that such trifling defects as they may have can easily be rectified by a skilful player. He condemns *seviatim* every innovation of Pottgiesser's, particularly the employment of the right hand thumb, and he says that "when the Viennese first lengthened the flute for the production of the low *b \flat* , the necessary key was given to the right hand thumb, but even this limited employment of the thumb was soon found to be inconvenient, and therefore the *b \flat* key [to close the *c'* hole] was afterwards given to the right hand little finger, the touch of the key being in a line with those of the [so-called] *c'* and *c' \sharp* keys." According to Grenser, the finger-holes of

Pottgiesser's flute are not well-placed, but this he thinks may be remedied, and he remarks: "Perhaps these faults are on account of the positions for the holes being calculated according to the divisions of the monochord, whereas the flute ought to be tuned, like the piano-forte, to equal temperament. If the skilful flutist wishes, for the sake of a particular effect, to make the 'leading note' somewhat higher than usual, and the *seventh* in the chord of the dominant somewhat lower, then he will effect his purpose either by the selection of suitable fingerings or by altering his manner of blowing."

Then follow a list of "good flute-makers," all Germans but one, and the remark: "as Dr. Pottgiesser evidently knew of no good flutes, his struggles for perfection were praiseworthy even though ill-directed."

From this time nothing further seems to have been heard of the enthusiastic and ingenious doctor, though my next chapter will show that his efforts began to bear excellent fruit three years afterwards.

547. A pleasing Episode in the History of the Flute.

The following notices appeared in *The Quarterly Musical Magazine and Review* for the years 1825 and 1826.

Hereford Festival. September, 1825: "Miss Cann, a little girl of twelve years old, the daughter of Mr. John Cann of Hereford, played Drouet's 'God Save the King' in a manner that evinced much musical talent."

Gloucester Festival. September 13th, 1826: "Miss Cann played a French air with variations by Tulou, between the parts of the concert." Nicholson played the *obbligato* to Bishop's "Lo! here the gentle lark" at the same concert.

September 15th: "Miss Cann played Drouet's 'Rule Britannia,' and exhibited very extraordinary marks of talent upon an instrument which has long been abandoned to the other sex. Her tone is clear and sound, her execution rapid and neat."

From the above remarks we are led to the conclusion that flute-playing was a less common feminine accomplishment in those days than it happily is at present.

548. The Flute in 1826-7. The flute was never more popular than at this period of its history. In England, France and Germany, especially, there were not only excellent manufacturers, but many fine performers, both professors and amateurs. The music for the flute was perhaps no better and no worse than that for other instruments; all the greatest composers were making free use of the flute in orchestral and chamber-music, and if there were, for that instrument, numbers of airs with variations which were not of great merit, there were, on the other hand, many fine classical compositions, in which a prominent part was assigned to it, by Bach, Beethoven, Gabrielski, Gluck, Handel, Haydn, Hoffmeister, Hummel, Kuhlau, Kummer, Mozart, Reicha, Schneider, Spohr, Tulou, Walckiers, Weber, and a host of stars of lesser magnitude.

Amongst the distinguished professors of the day were Ashe, Birch, Carte, then only nineteen years of age, Lindsay, Nicholson, Roe and Rudall; Berbiguier, Camus, Drouet, Farrenc, Guillou, Tulou and Walckiers; Bayr, Dressler, Fuerstenau, Gabrielski, Karl Grenser, Kuhlau, Kummer, Saust, Soussmann and Weiss; Boucha, afterwards known as Bucher, Gianella, Monzani, Negri, Rabboni and Sola.

Noted amongst manufacturers were Clementi and Co.; Gerock, Astor and Co.; Monzani and Hill; Potter, and Rudall and Rose: Buffet, Godfroy, Laurent, and Nonon: Grenser and Wiesner; Griesling and Schott; Koch, and Liebel.

549. Though neither Potter nor Monzani made flutes with the large holes of the Nicholsons, they were obliged, in common with the other English flute-makers, to follow to some extent the prevailing fashion of the time, and the small holes of 1807 *circa* went completely out of use in this country.

It has been stated that the large-holed flutes of Rudall and Rose were unrivalled in tone, and even if their intonation was not as perfect as might have been wished, still they were better in that respect than those of any other makers.

The tuning of the lowest octave of an excellent specimen of these flutes was tested by Mr. A. J. Ellis and myself, and the

results are given in his latest edition of the *Tonempfindungen* of Professor Helmholtz, (1885).

550. The table below is compiled from the MS. kindly sent to me by Mr. Ellis.

Notes.	Vibrations observed. Given to the nearest whole number.	Theoretical vibration numbers for equal temperament.	Theoretical vibration numbers for meantone temperament.
c'' \sharp	560	571.4	564.6
c''	543	539.2	540.4
b'	518	509.0	505.0
b \flat	478	480.5	483.3
a'	461	453.3	451.7
g \sharp	426	428.0	422.1
g'	404	404.0	404.0
f \sharp	381	381.3	377.6
f'	360	359.9	361.4
e'	341	339.7	337.7
d \sharp	314	320.7	323.2
d'	299	302.7	302.1
c \sharp	280	285.7	282.3
c'	268	269.6	270.2

551. As the object of the experiment was to prove the real intonation of the instrument, I was of course extremely careful to avoid correction. To that end, before and after each observation, the sounding of the flute was tested by comparing the pitch of its g' with that of a resonating jar previously tuned to 404 vibrations. The note g' was selected as a *datum* because it was the nearest to the average pitch of the instrument. Both the f \sharp and the g were fingered with the f \sharp key open, and the c'' was fingered with the long key. The flute was sounded at its mean pitch, and was carefully kept at an even temperature. Mr. Ellis used a Scheibler's fork-tonometer tuned by himself. See §295.

At the time of the experiment it was thought that the flute was about forty years old, but the probable date of its manufacture was afterwards found to be 1827.

552. I regret that I allowed this instrument to pass out of my keeping without taking its measurements, but I find the bore of a similar instrument, made by the same firm at about the same time, to be as follows :

	Diameter.
	<i>Inch.</i>
Head-joint, - - - - -	.74
Upper end of the second joint, - - - - -	.74
Lower end of the second joint, - - - - -	.59
Upper end of the third joint, - - - - -	.61
Lower end of the third joint, - - - - -	.54
Upper end of the foot-joint, - - - - -	.52
Open end, - - - - -	.44

At a distance of one inch from the open end, the bore becomes cylindrical. In other respects the flute closely resembles that described in §540, excepting that the *b*, *g* and *f* \sharp holes are .02 inch smaller than the corresponding holes of the Nicholson flute, and that the distance between the *e* and *f* \sharp holes is .16 inch greater, the *e* hole being bored perpendicularly.

This instrument was kindly lent to me by Messrs. Keith, Prowse and Co.

553. From the time of the invention of the *d* \sharp key, until after the year 1827, little seems to have been attempted in France towards the improvement of the intonation or the tone of the flute, and the strongest objections were urged, both in that country and in Germany, against the large holes. In fact, while the English were enlarging the holes the French were reducing them and making them more equal in size, but though by this means the notes were rendered rather more uniform in strength and clearness (or, as might be said, in weakness and want of clearness) of tone, the intonation was certainly not improved, and the general power and brilliancy suffered considerably.

The bore and the finger-holes, as made in Germany, were slightly larger than those adopted in France, but both French

and German performers generally preferred a small, sweet tone to the powerful and rich one for which the English were celebrated, particularly in the lowest octave. Berbiguier, alone amongst the French, protested against the poverty of the tone of his countrymen, and in an interesting letter to the Editor of the *Flutist's Magazine* (1827), in allusion to his *Méthode*, he says: "I should be glad if you had a more intimate acquaintance with that work; you would then be aware that I was the first in France to recommend, above all things, a fine tone in the lower notes. This innovation I claim as my own, and I am manifestly in opposition to our *joueurs de flageolet*, who nevertheless call themselves professors of the flute."

Though the French flutes were undoubtedly inferior to those of England, and even to those of Germany, in intonation and tone, they were far superior in beauty of appearance. Instead of the clumsy and unsightly knobs used by the English and the Germans, the French manufacturers mounted their keys on the silver pillars described in §381, and in the construction of their keys, as well as in the general excellence and elegance of their workmanship, they stood pre-eminent.

554. *The Fingering of the "Eight-keyed Flute."* The following table shows the formation of the best notes of the ordinary eight-keyed flute. The exceptional fingerings, for the different styles of flutes of this type, will be found in §§783-5. The keys indicated by the figures 1 and 2 are generally called the *c'* \sharp and *c'* \sharp keys because they are used for making those notes. It should be observed that these keys are placed over the *c'* \sharp and *d'* holes. No. 2 is closed by No. 1.

FIG. 51.

555. The annexed diagram is a representation of a large-holed eight-keyed flute, made by Rudall and Rose about the year 1827.

Explanation of Diagram.

Open holes.

I., II., III. The $c''\sharp$, b and a holes, closed by 1 L, 2 L, and 3 L.

IV., V., VI. The g , $f\sharp$ and e holes, closed by 1 R, 2 R, and 3 R.

Open keys.

1. Key for making c' by the closing of the $c''\sharp$ hole.

2. Key for making $c''\sharp$ by the closing of the d' hole.

These two keys are used by 4 R.

Closed keys.

3. The $d\sharp$ key, opened by 4 R.

4. The short f key, opened by 3 R.

5. The long f key, opened by 4 L.

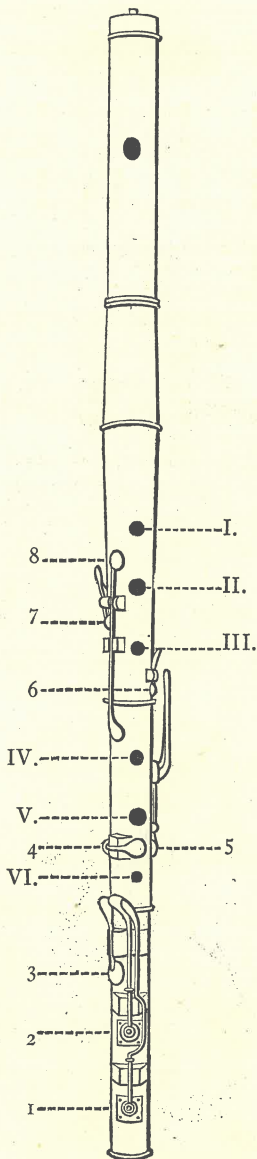
6. The $g\sharp$ key, opened by 4 L.

7. The $b\flat$ key, opened by th L.

8. The long c'' key, opened by 1 R.

The keys 4 and 5 are, of course, interchangeable.


The keys are indicated, in the table, only when they are to be used.



556.

557. Many of the preceding fingerings, having been already analysed, need no further explanation, but it will be interesting to observe the formation of some of the notes of the third octave, particularly those which are produced by means of the holes of the additional keys.

The first fingering for c''' gives the harmonic *twelfth* of f' , which is aided by the opening of the b hole, though it is not the true vent-hole. The second fingering of d''' gives the harmonic *twelfth* of g' , aided by the c'' hole, an improper vent-hole. The first fingering of f''' gives the harmonic *fifteenth* of $e'b$, sharpened to the extent of a whole *tone* by the opening of the g , g' , a and b_b holes. The second fingering of this note gives the harmonic *fifteenth* of f , aided by the a hole, which, being above its true position, answers fairly well as a vent-hole. The f''' is the harmonic *seventeenth* of d' , the f'' and b_b holes being the vent-holes. The b_b hole is the better able to act in that capacity by reason of its false position. The first fingering of b''' is merely a sharpening of a''' . The second fingering of b''' gives the harmonic *seventeenth* of $g'b$, flattened by the closed f hole, but improved by the improper vent-holes, the a and c'' holes. The analysis of the remaining notes will form an agreeable exercise for the curious student.

558. For many years the French, the Germans and the Italians continued to use the fingerings of the one-keyed flute for the notes of the third octave, but, although these fingerings were generally discarded by the English, the d and the e_b holes were often placed in their old evil positions, even in this country. With the e_b hole in its correct place the f''' fingered thus:  would have been impossible, but after the abandonment of this fingering the placing of the e_b hole so low was quite unjustifiable.

Nicholson avoided the use of the long f key by dexterously sliding his finger on and off the short key. Tulou, equally averse to the long key, used the fork f in rapid passages. Drouet, always actuated by a spirit of opposition to the teaching of Nicholson, was a staunch advocate for the long f

key, though he did not scruple to make frequent use of fork-fingerings.

559. *Keys occasionally added.* Besides the eight keys in general use, the following levers and keys were sometimes employed.

I. A lever for opening the b_b key with the first finger of the right hand. See §481. This was chiefly used for shakes.

II. A closed key governing a hole above the c'' hole. It was opened by the first finger of the right hand. Besides being extremely useful for the shakes $b'-c''$ and $b''-c'''$, it made the shakes $c''-d''$ and $c'''-d'''$, though imperfectly.

III. A closed key governing a hole above that last mentioned, also opened by the first finger of the right hand. It was used for making the shake $d'''-e'''$. These two keys supplied the place of the key of Capeller (see §521), and the work of the latter key was advantageously divided between them. It was of course impossible for any single key to be properly adapted to fulfil such a variety of purposes as were assigned to Capeller's key. The keys above the c'' hole, which were sometimes three in number, were often only the means of effecting indifferent compromises.

IV. A third lever for f , governed by the left hand thumb, and used for the sequence of d' , f' and g' , etc.

V. An extra g' key, opened by the left hand thumb.

VI. An open key for making b by closing a lateral c' hole. This key was sometimes closed by the little finger of the right hand, see §546, and sometimes by the little finger of the left hand.

VII., VIII., IX., X. Open keys for making b_b , a , a_b and g . The extension of the compass below c' was more common sixty years ago than at present. Many flutes descended to b_b , and a few, made in Vienna by Trexler and by Koch, and in Paris by Laurent (1834), even as far as the g of the violin. This note of course required seven keys below the d'' key. Three of these were given to the little finger of the right hand; two to the little finger of the left hand, and two to the left hand thumb.

All these were fitted with metal plugs. The lower end of the flute was turned back from a place below the b hole, the open end reaching upwards almost to the $d\sharp$ hole. The well-known Sedlatzek played on a flute of this kind made by Koch, now in the collection of Mr. Henry Carte. It is said that on one occasion only, Sedlatzek succeeded in sounding the g , and that he was so delighted at his unexpected success that he stood the flute up in a corner and saluted it with a profound obeisance!

XI. A closed key covering a hole placed above the usual small $f\sharp$ hole of the French flute, and opened by the third finger of the right hand. By means of the extra $f\sharp$ hole and its key the pitch of the $f\sharp$ and $f''\sharp$ could be raised, while the "fork f " was not destroyed as it would have been by the enlargement of the ordinary $f\sharp$ hole. This key was first applied to the flute by Nonon of Paris, who was working under the direction of Tulou, but it had been in use on the hautboy and the clarinet for many years.

Some time after the introduction of the closed $f\sharp$ key, an open one, governed by rings, was substituted for it. There may be a slight anachronism in the mention of either of these keys in this chapter; I am anxious, however, to take a final leave of the "old flute," as far as its history is concerned, for such improvements as were afterwards effected in it sink into absolute insignificance in comparison with the great and fundamental changes that form the subject of the next chapter.

560. List of Instruction-Books, etc. Amongst the numerous instruction-books, *méthodes*, *Flöten-schulen*, and other works of the kind, that were published between the years 1730 and 1827, besides those quoted in this work, the following may be mentioned. Many of the books in this list were printed without dates, and in such cases I could only rely on the opinions of commentators and bibliographers, especially Lichtenthal (1826), and on the internal evidence of the works themselves; the list is, however, arranged in chronological order as nearly as possible.

SCHICKHARD (JOHANN CHRISTIAN), *Principes de la Flûte*, etc. *Amsterdam*. 1730.

MAHAUT (ANTON), or ANTOINE MAHAULT, *Nouvelle Méthode pour apprendre en peu de temps à jouer de la Flûte traversière*, etc. *Amsterdam*. 1759.

DELUSSE (CHARLES), *L'Art de la Flûte-traversière*. *Paris*. 1761.

ANONYMOUS. *The Compleat Tutor for the German Flute*. Containing the Best and Easiest Instructions for Learners to Obtain a Proficiency. Translated from the French. Printed for and sold by Thompson and Son, Musical Instrument Makers, at *The Violin, Hautboy and German Flute*. *London*. 1765 circa.

TAILLARD (——— AÎNÉ), *Méthode pour apprendre à jouer de la Flûte traversière, et à lire la Musique*, etc. *Paris*. 1782.

KAUER (FERDINAND), *Kurzgefasste Anweisung die Flöte zu spielen*. *Wien*. 1788.

SCHLEGEL (FRIEDRICH ANTON), *Gründliche Anweisung die Flöte zu spielen, nach Quanzens Anweisung*. *Grätz*. 1788.

RÖSER (———), *Méthode de Flûte*. *Paris*.

VANDERHAGEN (ARMAND), *Méthode claire et facile pour apprendre à jouer en très peu de temps de la Flûte*. *Paris*. 1798.

MÜLLER (AUGUST EBERHARD), *Ueber die Flöte und wahres Flötenspiel*. 1798.

CAMBINI (GIUSEPPE), *Méthode pour Flûte*, etc. *Paris*. 1799.

KREITH (CARL), *Anweisung wie alle Töne auf der Flöte traversière richtig zu nehmen sind nebst ihren gehörigen Benennungen*. *Wien*. 1799.

DAUSCHER (ANDREAS), *Kleines Handbuch der Musiklehre und vorzüglich der Querflöte*. *Ulm*. 1801.

MONZANI (TEBALDO), *Instructions for the German Flute*. *London*. 1801

MICHEL (FRANÇOIS LOUIS), *Nouvelle Méthode de Flûte*. *Paris*. 1802.

KREITH (CARL), *Schule für die Flöte in 115 Lectionen*. *Wien*.

DORMIEULX (H. F. L.), *Méthode pour la Flûte*. *Paris*. 1802.

BOCHSA (CHARLES), *Méthode de Flûte, avec des Airs*. *Paris*.

PERRAULT (———), *L'art de la Flûte: en deux Parties*. *Paris*.

VAILLANT (P.), *Méthode de Flûte*, etc. *Paris*.

KLINGENBRUNNER (WILHELM), *Neue Theoretisch-praktische Flötenschule*. *Wien*.

FRÖLICH (J.), *Flötenschule*. *Bonn und Köln*.

MÜLLER (AUGUST EBERHARD), *Elementarbuch für Flötenspieler, mit Tabellen*, etc. *Leipzig*. 1817.

NICHOLSON (CHARLES), *Complete Preceptor for the German Flute*. *London*. 1820 circa.

BAYR (GEORG), *Practische Flötenschule*. *Wien*. 1823.