Mersenne's@@1 account of the transverse flute, then designated “flûte d’allemand” or “flûte allemande” in France, is obscure enough ; but the tablatures and an “Air de Cour ” for four flutes in his work lead us to believe that there were then in use in France the sopra the tenor and the bass

no flute , or alto flute descend-

in flute in ing to

The Museum of the Conservatoire Royal of Brussels pos­sesses specimens of all varieties hitherto mentioned except the last. All of them are laterally pierced with six finger holes;@@2 they have a cylindrical bore, and are fashioned out of a single piece of wood. Their compass consists of two octaves and a fifth. The successive opening of the lateral holes gives rise to a series of fundamental notes forming the first octave. By a stronger pres­sure of the breath these notes are reproduced in the next octave higher, and the extent of compass of the instrument is completed in the higher region by the production of other harmonics.@@3

The largest bass flute in the Brussels museum is in at the French normal pitch A 435 double vibrations per second. It measures 0∙95 m. from the centre of the blow orifice to the lower extremity of the tube. The disposition of the lateral holes is such that it is impossible to cover them with the fingers if the flute is held in the ordinary way. The instrument must be placed against the mouth in an almost vertical direction, inclining the extremity of the tube either to the right or the left. This inconvenient position makes it necessary that the instrument should be divided into two parts, enabling the player to turn the head joint that the embouchure may be most com- modiously approached by the lips, which is not at all easy. The first and fourth of the six lateral holes are double, but those holes are stopped up with wax which have become useless through the player’s habit of using the fingers of the right or left hand to cover the higher three holes. The bass flute shown in fig. 1 is the facsimile of an instrument in the Museo Civico of Verona. The original, unfortunately no longer fit for use, is nevertheless sufficiently well preserved to allow of all its proportionate measurements being given. The lowest note, E♭, is obtained with a remarkable amplitude of sound, thus upsetting a very prevalent opinion that it is impossible to produce by lateral insufflation sounds which go a little lower than the ordinary limit downwards of the modern orchestral flute.@@4

The bass flute cited by Mersenne should not differ much from that of the Museo Civico at Verona. We suppose it to have been in and that it was furnished with an open key like that which was applied to the recorders (*flûtes douces*) of the same epoch, the function of the key being to augment by another note the compass of the instrument in the lower part. Following Quantz,@@5 it was in France and about the middle of the 17th century that the first modifications were introduced in the manufacture of the flute. The improvements at this period con­sisted of the abandonment of the cylindrical bore in favour of a conical one, with the wide part in the head of the instrument. At the same time the flute was made of three separate pieces called head, body, and foot, which were ultimately further subdivided. The body or middle joint was divided into two pieces, so that the instrument could be tuned to the different pitches then in use by a replacement with longer or shorter pieces. It was probably about 1677, when Lully introduced the German flute into the opera, that recourse was bad for the first time to keys, and that the key of D♯ was applied to the lower part of the instrument.@@6 The en­graving of B. Picart, dated 1707, which ornaments the work of the French flautist Hotteterre-le-Romain,@@7 represents the flute as having reached the stage of improvement of which we have just spoken, but the body was still formed of one piece only. In 1726 Quantz,@@8 finding himself in Paris, had a second kev applied to

the flute, placed nearly at the same height as the first, that of the , intended to differentiate the D♯ and the E♭. This innovation was generally well received in Germany, but does not appear to have met with corresponding success in other countries. In France and England manufacturers adopted it but rarely; in Italy it was declared useless.@@9 About the same time flutes were constructed with the lower extremity lengthened and furnished with two supplementary keys to produce the C♯ and C. This innovation, spoken of by Quantz, did not meet with a very favourable reception, and was shortly afterwards abandoned. Passing mention may be made of the drawing of a flute with a C key in the *Music-Saal* of J. F. B. Mayers, Nuremberg, 1741.

The tuning of the instrument to different pitches was effected, as already explained, by changes in the length, and notably by substituting a longer or shorter upper piece in the middle joint. So wide were the differences in the pitches then in use that seven such pieces for the upper portion of it were deemed necessary. The relative proportions between the different parts of the instru­ment being altered by these modifications in the length, it was conceived that the just relation could be re-established by dividing the foot into two pieces, below the key. These two pieces were adjusted by means of a tenon, and it was asserted that, in this way, the foot could be lengthened proportionately to the length of the middle joint. Flutes thus improved took the name of “flûtes à registre.” The register system was, about 1752, applied by Quantz to the head joint, and, the embouchure section being thus capable of elongation, it was allowable to the performer, according to the opinion of this professor, to lower the pitch of the flute a semitone, without having recourse to other lengthening pieces, and without disturbing the accuracy of intonation.

The upper extremity of the flute, beyond the embouchure orifice, is closed by means of a cork stopper. On the position of this cork depends, in a great measure, the accurate tuning of the flute. It is in its right place when the accompanying octaves are true. Quantz, in speaking of this accessory, mentions the use of a nut-screw to give the required position to the cork. He does not name the inventor of this ap­pliance, but, according to Tromlitz,@@10 the improvement was due to Quantz himself. The invention goes back to 1726.

When the *Method* of Quantz appeared there were still in use, besides the orchestral flute in D, the little fourth flute in G, the low fourth flute in A, and the flûte d’amour a note higher ; in France they had, moreover, the little octave flute in D (octave). A bass flute in D had also been attempted (see fig. 2). When Ribocq published his *Bemerkungen* *über die Flöte@@*11 the flute had already the five keys here shown. This author does not cite the inventor of these new keys, but some claim them for Kusder, a musical-instru­ment maker in London, others for Johann

George Tromlitz of Leipsic, and Ribocq declares he has seen no flutes so constructed other than by these two makers. But Tromlitz lays no claim for himself to the credit of this improvement. He only says that “ he had occupied himself for several years in applying these keys so as not to augment the difficulty of playing, but, on the contrary, to render the handling of them as easy as possible.”@@12 We may therefore regard the London maker as the author of the first flute with five keys, with, however, a reservation as to the G# key, which, from 1727, had been applied by Hoffmann of Rasten­berg@@13 to the transverse flute and the oboe. The higher key of C♮, adopted from 1786 by Tromlitz, we believe to have been first re­commended by Ribocq (1782).

In 1785 Richard Potter, of London, improved Quantz’s slide applied to the head joint as well as to the register of the foot by a double system of tubes forming double sliding air-tight joints. In the document@@14 describing this improvement Potter patented the idea of clothing the holes which were covered by keys formed by metal conical valves. The keys mentioned in the patent were four,—D♯ F, G♯, A♯. The idea of extending the compass of the flute downwards was "taken up again about the same time by two players of the flute in London named Tacet and Florio. They de­vised a new disposition of the keys C and C♯ and confided the execu­tion of their invention to Potter. In Dr Arnold’s *New Instructions* for the German Flute occurs a tablature, the engraving of which goes back to the end of the 18th century, and bears the following title, “ A Complete Drawing and Concise Scale and Description of Tacet and Florio’s new invented German Flute, with all the addi­tional keys explained.” It explains the use of six keys,—C, C♯, D♯, F, G♯, A♯ —that are not always figured, because the employ­ment of so many keys was at once admitted. Tromlitz himself, who, however, made flutes with nine keys,—adding E♭, another F, and C♮, declared that he was not in favour of so great a complica­tion, and that he preferred the flute with only two keys, D♯ and E♭

*@@@1 Harmonie Universelle,* Paris, 1636.

@@@ 2 It is usual to indicate the tonality of flutes by the note produced when the six lateral holes are covered by the fingers. This custom is objectionable, because it is the disposition of the fingers which is made use of to sound D. The prac­tice has for its result that the tonality is always a note lower than the signature used. Thus the flute in D is really in C ; that in F in E♭, &c.

@@@3 Victor Mahillon, *Hints on the Fingering of the Boehm Flute,* London, 1884.

@@@4 Fétis, *Rapport sur la Fabrication des Instruments de Musique à l'Exposition Universelle de Paris, en 1855.*

@@@5 *Versuch einer Anweisung die Flöte traversiere zu spielen,* Berlin, 1752.

@@@6 Unless where the contrary is stated, we have always in view, in describing the successive improvements of the flute, the treble flute in D, which is considered to be typical of the family.

@@@7 *Principes de la Flûte Traversiere.*

@@@» “Herrn Johann Joachim Quantzius Lebenslauf, von ihm selbst entworfen ’’ in the *Historisch-Kritische Beiträge zur Aufnahme der Musik,* by Marpurg Berlin, 1754. Quantz was professor of the flute to Frederick the Great. ’

@@@9 Antonio Lorenzoni, *Saggio per ben sonare il flauto traverse,* Vicenza, 1779.

@@@10 *Ausführlicher und gründlicher Unterricht die Flöte zu spielen,* Leipsic, 1797. Compare Schilling, *Univ.-Lexicon,* Leipsic, 1835.

@@@11 Stendal, 1782.

*@@@12 Kurze Abhandlung von Flötenspielen,* Leipsic, 1786.

@@@13 Gerber, *Lexicon der Tonkünstler,* Leipsic, 1790.

@@@14 English patent, No. 1499.