nics obtained by leaving the instrument at its shortest length— that is, with the slide close up ; it in fact comprises seven positions, which are obtained by shifting the slide as many lengths and in such a way that each of these produces a series of harmonics a semitone lower than the length which has preceded. This system, so simple and rational, might have been expected always to serve for the basis of the technique of the instrument ; but from the middle of the 18th century the art of playing the trombone became the object of purely empiric teaching. Only four positions were made use of.@@1 By the first—that is, with the slide close up—there was obtained from the ordinary trombone, then called the tenor trom­bone, the first series of the subjoined harmonics (the numerals indicating the order) : the fundamental or first note being difficult to obtain ; the second position produced

the third position produced

In thus lowering by semitones, the

and the fourth sounds furnished by the four positions

gave the tenor trombone a diatonic scale from This scale was formed with notes that could be perfectly just, but the result would have been less satisfactory to the ear if the player had strictly observed the rules laid down by the teaching of that period for the production of the chromatic intervals. Thus to pass from a note furnished by one of the four positions to another a semitone lower it was necessary to lengthen the slide by two fingers ; if the semitone higher was required the slide had to be shortened to the same extent.@@2 A consideration of the laws affecting lengths of pipes will show the viciousness of that rule.

Of all wind instruments the trombone has perhaps been least modified in form ; changes have occasionally been attempted, but for the most part with only trifling success. The innovation which has had the most vogue dates from the end of the 18th century ; it consisted in bending the tube of the bell in a half circle above the head of the executant, which produced a very bizarre effect. It also gave rise to very serious inconveniences: by destroying the regularity of the proportions of the bell it pre­judicially affected the quality of tone and intonation of the instru­ment. For a long time the curved bell with its serpent’s mask was maintained in military music, and it is only about twenty years ago that it was completely given up. By giving a half turn more to the bell tube its opening was directed to the back of the executant ; but this form, in fashion for a little while about 1830, was not long adhered to, and the trombone reassumed its primitive form, which is still maintained. As appears from a patent de­posited by Stölzel and Blümel at Berlin on 12th April 1818, the application of ventils or pistons was then made for the first time.@@3 The ventils, at first two in number, effected a decided lengthening of the instrument. The first augmented the length of the tube by a tone, lowering by as much the natural harmonics. The second produced a similar effect for a semitone, and the simultaneous em­ployment of the two pistons resulted in the depression of a tone and a half. The principle, therefore, of the employment of ventils or pistons is the same as that which governs the use of slides. For instance, a trombone is provided with three pistons, and without their help it produces the first of the following sets of harmonics (the numbers indicating the order). Then by pressing down the second piston we obtain a lengthening of the column of air that lowers the in­strument by a semitone and makes it produce the second set of harmonics here shown ; with the aid of the first piston we relengthen the column, so as to get a whole tone lower, produc­ing the third set of sounds ; the third piston, in the same way, lowers the instrument a tone and a half, as in

(4) ; by the simultaneous employ­ment of the second and third pis­tons we arrive at two tones, as in (5) ; the combination of the first and third pistons lowers the instrument two tones and a half, as shown in (6) ;

finally, uniting the three pistons lowers the trombone three tones and a half, as shown in (7).

Notwithstanding the increased facility obtained by the use of pistons, they are very far from having gained the suffrages of all players : many prefer the slide, believing that it gives a facility of emission that they cannot obtain with a piston trombone. For this illustration of the use of pistons, we have taken a tenor trombone in B♭ ; the flat tonalities having been preferred for military music since the commencement of the 19th century, the pitch of each variety of trombones has been raised a semitone. At present six trom­bones are more or less in use, viz., the alto trombone in F, the alto in E♭ (formerly in D), the tenor in B♭ (formerly in A), the bass in G, the bass in F (formerly in E), the bass in E♭ (formerly in D). This transposition has no reference to the number of vibrations that may be officially or tacitly adopted as the standard pitch of any country or locality. A trombone an octave lower than the tenor has recently been reintroduced into the orchestra, principally by Wagner. The different varieties just cited are con­structed with pistons or slides, as the case may be. (V. Μ. )

TROMP, the name of two famous Dutch admirals.

I. Martin Harpertzoon Tromp (1597-1653) was born at Brielle, South Holland, in 1597. At the age of eight he made a voyage to the East Indies in a merchantman, but was made prisoner and spent several years on board an English cruiser. On making his escape to Holland he entered the navy in 1624, and in 1637 was made lieutenant­admiral. In February 1639 he surprised, off the Flemish coast near Gravelines, a large Spanish fleet, which he com­pletely destroyed, and in the following September he de­feated the combined fleets of Spain and Portugal off the English coast—achievements which placed him in the first rank of Dutch naval commanders. On the outbreak of war with England Tromp appeared in the Downs in command of a large fleet and anchored off Dover. On the approach of Blake he weighed anchor and stood over towards France, but suddenly altered his course and bore down on the English fleet, which was much inferior to his in numbers. In the engagement which followed (19th May 1652) he had rather the worst of it and drew off with the loss of two ships. In November he again appeared in command of eighty ships of war, and a convoy of 300 merchantmen, which he had undertaken to guard past the English coast. Blake resolved to attack him, and, the two fleets coming to close quarters near Dungeness on the 30th November, the English, after severe losses, drew off in the darkness and anchored off Dover, retiring next day to the Downs, while Tromp anchored off Boulogne till the Dutch merchantmen had all passed beyond danger. The statement that he sailed up the Channel with a broom at his masthead in token of his ability to sweep the seas is probably mythical. In the following February (1653), while in charge of a large convoy of merchantmen, he maintained a running fight with the combined English fleets under Blake, Penn, and Monk off Portland to the sands of Calais, and, though baffling to some extent the purposes of the English, had the worst of the encounter, losing nine ships of war and thirty or forty merchantmen. On 3d June he fought an indecisive battle with the English fleet under Dean in the Channel, but the arrival of reinforcements under Blake on the following day enabled the English to turn the scale against him and he retired to the Texel with the loss of seventeen ships. Greatly discouraged by the results of the battle, the Dutch sent commissioners to Cromwell to treat for peace, but the proposal was so coldly received that war was imme­diately renewed, Tromp again appearing in the Channel towards the end of July 1653. In the hotly-contested conflict which followed with the English under Monk on the 29th Tromp was shot by a musket bullet through the heart. He was buried with great pomp at Delft, λvhere there is a monument to his memory in the old church.

*@@@1 Der sich selbst informirende Musicus,* Augsburg, 1762, by Johann Jacob Lotter.

@@@2 It need hardly be remarked that the higher semitone cannot be produced in the first position.

@@@3 This was mentioned in the Leipsic *Allgemeine musikalische Zeitung* in 1815, the merit of the invention being assigned to Heinrich Stölzel of Pless in Silesia.