(No Model.)

C. T. GIORGI.

FLUTE.

No. 594,735. Patented Nov. 30, 1897.

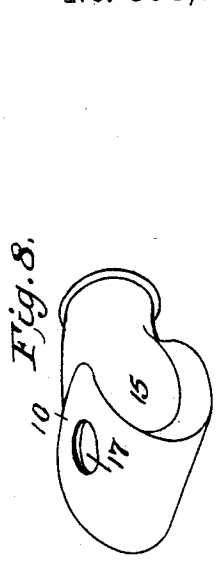

Fig. 8.

Fig. 1.

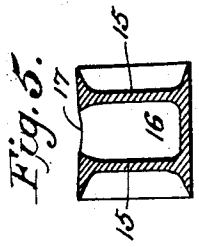

Fig. 5.

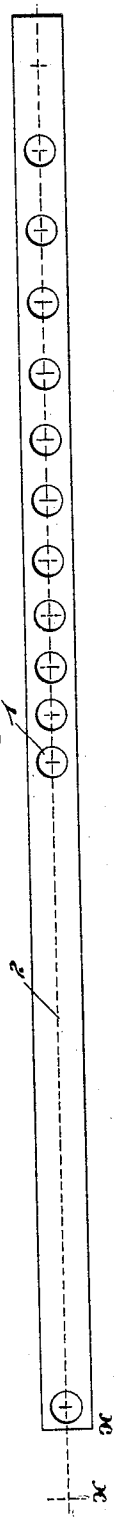

Fig. 2.

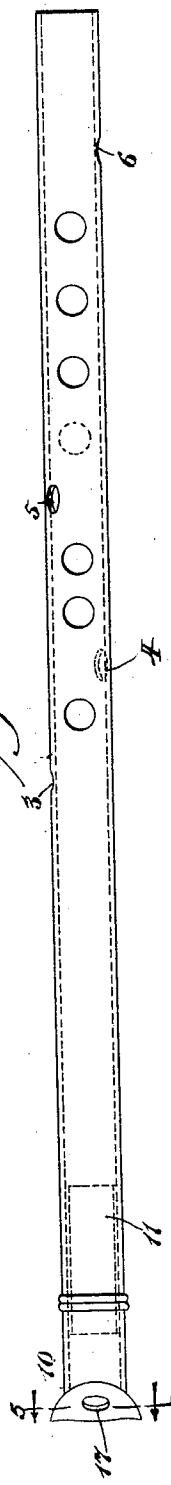

Fig. 3.

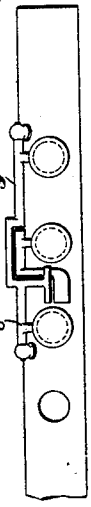

Fig. 7.

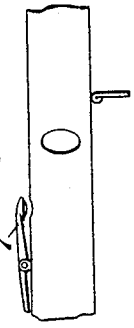

Fig. 6.

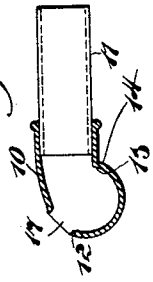

Fig. 4.

WITNESSES:

Edw. Thorpe.

C. R. Ferguson

INVENTOR

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BY

ATTORNEYS.

UNITED STATES PATENT OFFICE.

CARLO T. GIORGI, OF NEW YORK, N. Y.

FLUTE.

SPECIFICATION forming part of Letters Patent No. 594,735, dated November 30, 1897.

Application filed January 7, 1897. Serial No. 618,263. (No model.) Patented in Italy June 14, 1888, No. 171, and October 2, 1895, No. 39,663; in Switzerland March 13, 1896, No. 11,938; in Belgium March 16, 1896, No. 120,083; in England March 24, 1896, No. 6,515; in Austria April 3, 1896, No. 46/1,329, and in France June 8, 1896, No. 254,305.

To all whom it may concern:

Be it known that I, CARLO T. GIORGI, residing in New York city, in the county and State of New York, have invented new and useful Improvements in Musical Instruments, (for which I have obtained Letters Patent in the following countries: Italy, dated June 14, 1888, No. 171, and October 2, 1895, No. 39,663; Austria, dated April 3, 1896, No. 46/1,329; France, dated June 8, 1896, No. 254,305; Switzerland, dated March 13, 1896, No. 11,938; England, dated March 24, 1896, No. 6,515, and Belgium, dated March 16, 1896, No. 120,083,) of which the following is a full, clear, and exact description.

Keyless flutes, although used since an early date, have never been provided with the full number of eleven holes necessary to the natural production of the notes of the chromatic scale, and the holes they had were not disposed according to acoustic laws. When other holes were added covered with keys, these holes also were not arranged in accordance with theoretic requirements. Consequently the notes had not the right intonation nor equality of sounds. The keys often occasioned cross-fingering, which rendered the digitation very difficult and sometimes quite impossible. Afterward when the flute was radically reformed and was constructed more scientifically the holes were closed with ingenious mechanisms of keys, but these, besides being delicate and expensive and not always to be depended upon, will bind some one key with another, so that it is impossible to close one hole without being obliged to close another. In all these systems the fingering is complicated.

In all transversal flutes the higher harmonics by which the different octaves should be obtained are not perfect in their intonation, but rather flat in their progression. This is occasioned by the dispersion of the wind force through the form of the mouthpiece. In such flutes the air blown from the lips beats against the interior part of the pipe, from there is deflected toward the cork which stops the upper end of the pipe, then deflected again along the pipe, so that it produces dispersion of its force, which renders the harmonic rather flat. Therefore a special fingering is necessary to produce the notes of the third octave, closing some lower holes to reinforce the column of air, and also a slight modification of the normal distance apart of the holes is required. Therefore the intonation is not perfect. The quality of sounds is not homogeneous. The cross-fingering renders the execution difficult and sometimes impossible with the normal digitation.

As a remedy for all these imperfections in flutes I have invented an instrument entirely conformable to the laws of acoustics, possessing all the eleven holes necessary to the natural production of the chromatic scale. These are placed with mathematic exactness and in conformity with the natural position of the fingers, by which they can be closed without the necessity of keys. Each hole can be closed independently, and there is no cross-fingering. Thus in the diminution of the mechanism the instrument becomes lighter, simpler, and less expensive. The mouthpiece is at the upper extremity of the pipe and disposed for blowing directly instead of transversely to avoid the dispersion of wind and so that the harmonics of the twelfth are got in perfect intonation, and no special fingering is required for the production of the third octave. The holes are left in their normal place, and the notes are given of perfect intonation and equality of sound from the lowest to the highest. In this flute the air is blown straight along the pipe, so that there is no attrition or dispersion of its force, and the octave is rendered in perfect intonation with the fingering of the harmonic of the fifth below.

I will describe a flute embodying my invention and then point out the novel features in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 shows the scale by means of which the centers of the finger-holes may be found.

Fig. 2 shows a flute with the finger-holes therein in accordance with the scale. Fig. 3 is a plan view of a flute and the improved mouthpiece thereon. Fig. 4 is a longitudinal section of the mouthpiece. Fig. 5 is a transverse section thereof on the line 5 5 of Fig. 3. Fig. 6 shows a modification in which a key is employed. Fig. 7 is another modification showing keys, and Fig. 8 is a detail perspective view of the mouthpiece.

In carrying out the invention I employ a pipe corresponding to the fundamental note I wish to have. I divide its column of air in the proportions given by the acoustic laws for the graduation of the chromatic scale shown in Fig. 1 and mark the distance from center to center of the holes 1 in the flute or pipe 2. I proportion the size of the holes with regard to the diameter of the pipe, and the distance between the finger-holes gradually diminishes from the lower to the upper hole.

Fig. 1 shows the theoretical positions of the holes in a simple flute to give the chromatic scale, being the half-wave lengths of the corresponding notes; but it is well known that in an actual flute the holes are considerably nearer the mouthpiece than the half-wave length. Consequently Fig. 2 shows the distances of Fig. 1 diminished to correspond with the shortening found necessary in practice.

In Fig. 2 I have shown the holes arranged in a straight row. In Fig. 3, however, I have arranged certain of the holes out of line with the others, as shown at 3, 4, 5, and 6. This arrangement may be desirable to suit the conformation of the fingers of a player. In this form of the instrument the third phalange of the first finger of the left hand will be placed over the first hole, (numbered 3,) and the end of said finger will govern the second hole, the thumb of the left hand will govern the third hole, (numbered 4,) the next three holes will be governed, respectively, by the second, third, and little fingers of the left hand, the seventh hole will be governed by the thumb of the right hand, the eighth, ninth, and tenth holes by the first, second, and third fingers of the right hand, and the last hole 6 by the little finger of the right hand.

The scales are formed by progressively opening the holes, beginning with the one covered by the little finger of the right hand. The first hole 3 may be smaller than the remainder, as a resounding-harmonic to its octave.

Keys are not necessary, but they can be furnished, as shown at 7 in Fig. 6, and lower or higher supplementary notes can be added, as in other flutes, as shown by the keys 8 and 9 in Fig. 7.

The portion of an ordinary flute, as indicated at *x x* and which is generally provided with the regulating-cork, is removed, and in lieu of such cork for closing the upper extremity of the pipe I employ a mouthpiece, and preferably the mouthpiece will be conformed somewhat to the shape of a person's chin, against which it is designed to rest. As here shown, the mouthpiece 10 is removably mounted on the flute 2—that is, it has an extension 11, designed to engage within the end of the flute. The mouthpiece is substantially circular in cross-section, and its bore extends transversely to the length of the flute. By the circular formation of the interior of the mouthpiece a resounding-chamber is formed, as at 12 13, and the resistance to the blast of air is formed by the reëntering angle 14. The ends of the mouthpiece are flattened, as at 15, to compensate for the loud volume of air produced in the chamber 16. The mouthpiece is slightly bent in an oblique direction, and the mouth-hole 17 is arranged at the top of the mouthpiece, substantially in line with the interior of the flute, so as to enable the player to blow directly into the pipe instead of transversely.

The laying out of the finger-holes is illustrated in Fig. 1—that is, the flute is divided between A and B to find the octave at C, and then the octave is divided in twelve proportional parts to get the chromatic scale between B and C.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A mouthpiece for flutes, curved in direction of the length of the flute and provided with a mouth-hole on its top and with a resounding-chamber extending below the line of communication between said mouthpiece and the body of the flute, substantially as described.

2. A flute having eleven finger-holes, the first one of which is arranged out of line with the second hole, whereby the phalange of the first finger may engage over the first hole and the said finger engage with the second hole, whereby all of the eleven holes may be controlled by the ten fingers of a player, substantially as specified.

3. A mouthpiece for flutes substantially circular in direction of length of the flute and having its lower portion extending below the line of communication between said mouthpiece and the body of the flute whereby to form a resounding-chamber, substantially as shown and described.

4. A mouthpiece for flutes made substantially circular in the direction of length of the flute having its lower portion extending below the line of communication between said mouthpiece and the body of the flute and having its ends flattened all substantially as shown and described.

5. A mouthpiece for flutes, having its end widened to furnish a bearing for the chin and provided with a top opening and a resounding-chamber extending below the line of com-

munication between the mouthpiece and the body of the flute, substantially as described.

6. A mouthpiece for flutes, curved in direction of length of the flute, and provided with a mouth-opening in its top and a resounding-chamber extending below the line of communication between the mouthpiece and body of the flute, the end of the mouthpiece being widened to form a bearing for the chin, substantially as described.

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