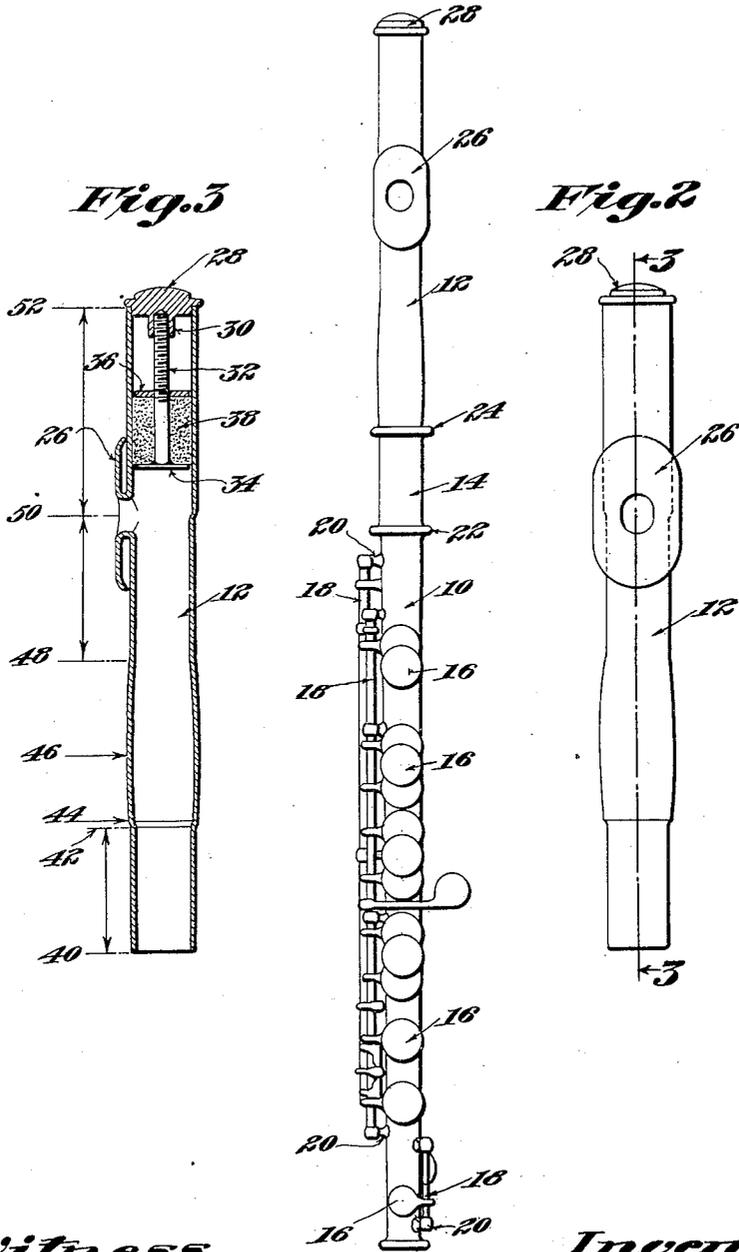


1,376,004.

Patented Apr. 26, 1921.  
 2 SHEETS—SHEET 1.

*Fig. 1*



*Witness*  
*M. Crozier*  
*E. F. Umas.*

*Inventor*  
*Nils Christensen*  
 By *Francis J. Dakin*  
*att*

N. CHRISTENSEN.  
 HEADPIECE FOR METALLIC PICCOLOS.  
 APPLICATION FILED JUNE 20, 1919.

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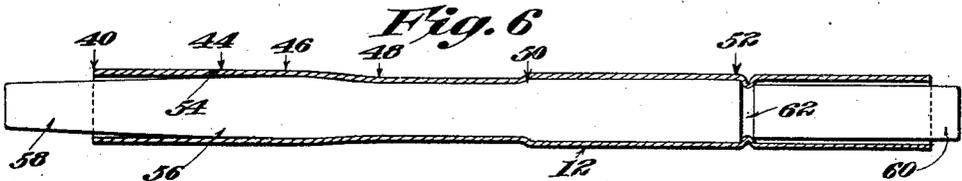


Fig. 7

Fig. 8

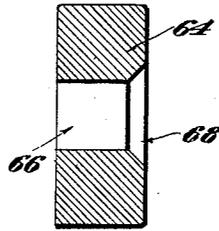
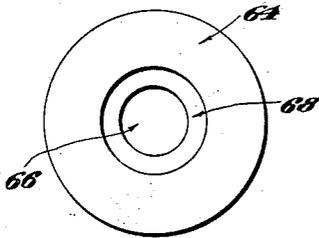
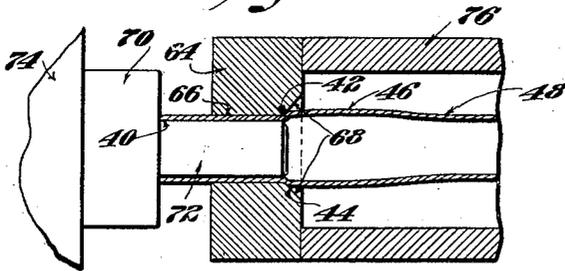


Fig. 9



Witness

*M. Blugin*  
 E. F. Uinac

Inventor

Nils Christensen  
 By Francis J. Dakin  
 Att.

# UNITED STATES PATENT OFFICE.

NILS CHRISTENSEN, OF BOSTON, MASSACHUSETTS.

## HEADPIECE FOR METALLIC PICCOLOS.

1,376,004.

Specification of Letters Patent. Patented Apr. 26, 1921.

Application filed June 20, 1919. Serial No. 305,553.

*To all whom it may concern:*

Be it known that I, NILS CHRISTENSEN, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Headpieces for Metallic Piccolos, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to a head-piece for piccolos, flutes, fifes and similar musical instruments and more particularly to a head-piece for instruments of the character described which are made entirely of metal.

Heretofore piccolos, flutes and similar musical instruments have generally been made of wood either with a conical or straight-bore because the tones produced on instruments made of that material were more easily produced and of better quality and volume than the tones secured from instruments made of metal. The use of wood, however, has been open to two objections, namely the time required for the preparation of the material and its liability to warp and crack even after the most careful preparation. It has been customary to subject the wood to a bath of oil for a long period of time, from six months to a year, in order to harden the material and to prevent warping or cracking. This long preparation greatly increases the cost of the instrument, yet in spite of such preparation, however careful, the wood frequently warps or cracks thereby rendering the instrument valueless.

In order to obviate the foregoing disadvantages flutes have been made of metal with a straight bore and piccolos partly of metal and partly of wood. The results, however, have not been entirely satisfactory. In the use of metal flutes, it is difficult and requires considerable skill to produce certain notes such as F sharp in the high register and G natural, F sharp, F natural, E natural, E flat and D natural in the lower register and such notes when produced are weak and of small volume.

So far as I know, a piccolo made entirely of metal has never been successfully used. Some piccolos have been made with a body-portion of metal with a cylindrical bore and a wooden head-piece, but the difficulty in producing the notes above mentioned is so greatly increased because of the diminutive size of the piccolo and the comparatively

small bore that exceptional skill is demanded for their production. That form of piccolo has never, however, gone into practical use.

The principal object of my invention is the production of an instrument of the character described which does not require exceptional skill for the production of all the notes of its register.

A further object is the production of an instrument made entirely of metal, whereby the long period of preparation of the material and warping and cracking may be obviated and thereby an instrument of comparatively low cost and great durability may be secured.

An additional object is the provision of a simple and effective method for making the head-piece embodying my invention.

Other objects of the invention will be more specifically set forth and described hereinafter.

My invention contemplates a head-piece having a bore which is slightly enlarged near the joint-end. I have found that in a piccolo so constructed I secure astonishing results in that all the notes hereinbefore mentioned and especially high F sharp and high B natural can be produced in good volume and with beautiful tones by a player of average ability using the regular flute fingering. So far as I am informed at the present time, my invention may be applied to metallic flutes, fifes and similar musical instruments.

In the drawings illustrating the preferred embodiment of my invention, Figure 1 is a top elevation of a piccolo having a head-piece constructed in accordance with my invention; Fig. 2 is a similar view on an enlarged scale of the head-piece; Fig. 3 is a longitudinal sectional view of the head-piece on line 3—3 in Fig. 2; Fig. 4 is a side elevation of an arbor for forming the head-piece; Fig. 5 is a longitudinal sectional view of a piece of tubing from which the head-piece is formed, showing the arbor within the tubing and before the tubing has been reduced to the arbor; Fig. 6 is a view similar to Fig. 5 but showing the tube reduced to fit the arbor; Fig. 7 is a plan view of a die for reducing the diameter of the joint-end of the head-piece; Fig. 8 is a cross-sectional view of the die shown in plan view in Fig. 7; and Fig. 9 is a view partly in section and partly in elevation of the die and

head-piece mounted in a lathe, illustrating the method of removing the die from the head-piece after the joint-end has been reduced.

5 In Fig. 1 of the drawings I have shown a complete piccolo comprising a body-portion 10 and a head-piece 12, the two being capable of separation at the joint 14. The body-portion 10 is of the usual well known construction, cylindrical in bore and having various stops 16, 16, supported on side rails 18, 18, carried by posts 20, 20, mounted on the body-portion 10. The end of the body-portion is enlarged at 14 to receive the joint-end of the head-piece and the body-portion 15 and the head-piece may be provided with beads 22 and 24 respectively to conceal the joint and to make an attractive appearance.

The head-piece is provided with a mouth-piece or embouchure 26 of usual construction and is closed by a cap 28 screw-threaded onto the end. On the inside surface of the cap 28 is arranged a central boss 30 which is bored and threaded to receive a screw 32 25 having a flat head 34 and a washer 36 between which is mounted a stop 38 for closing that end of the head-piece adjacent to the embouchure 26. All of the foregoing parts are of well known and usual construction.

30 The new feature of my head-piece consists in enlarging the bore of the head-piece adjacent to the joint. This enlargement begins at a point approximately half way between the mouth-hole in the embouchure and the joint portion of the head-piece and gradually increases to the highest point, remains constant for a short distance and then decreases slightly for a short distance until it reaches the joint where it drops to the constant dimension of the joint and the body-portion of the piccolo. In the drawings, Fig. 3, the head-piece is shown in sectional view and the enlargement is exaggerated in order better to show this feature. For the 45 purpose of illustration, I have shown in Fig. 3 various lines numbered 40 to 52 inclusive, directed to various parts of the head-piece, which is shown in this figure approximately full size, and the following inside dimensions in thousandths of an inch, I have found give excellent results. From point 50 40 to point 42 the inside diameter of the joint is 437 thousandths, the same as the inside diameter of the bore of the body-portion. Between points 42 and 44 the bore increases from 437 thousandths at 42 to 457 thousandths at 44. From point 44 to point 46, the bore gradually and uniformly increases to 459 thousandths at 46. For approximately one third of the distance between point 46 and point 48, the bore remains 459 thousandths and then drops gradually until at 48 it is 433 thousandths. Between points 48 and 50 the bore is constant 60 at 433 thousandths. At point 50 it increases

to 438 thousandths and remains at that figure to point 52. It is to be understood that the foregoing dimensions are given merely for the purpose of showing the relative proportions of a head-piece which I have 70 found to produce excellent results, but my invention is not to be restricted to these particular proportions since other proportions may be found to produce equally good or perhaps better results. 75

The preferred method of making my head-piece 12 is as follows. I first take a piece of suitable metal tubing 54 of greater length than the head-piece and place in it a steel arbor of the form shown in Fig. 4. The arbor has a main portion 56 which is in outside form and dimensions identical with the form and inside dimensions desired in the head-piece and reduced end portions 58 and 60. In Fig. 4 I have marked the parts of the arbor corresponding to the points 40 to 52 inclusive in Fig. 3. Near point 52 the arbor is provided with an annular groove 62 into which the metal tubing 54 is first spun in order to prevent its displacement on the arbor during the process of forming the tube around the arbor. 80 85 90

After the tubing has been arranged on the arbor as shown in Fig. 5, the arbor and tubing are pushed end 60 foremost through cakes of lead of substantially the form of the die shown in Figs. 7 and 8, having a central bore slightly smaller than the tubing. This operation reduces the size of the tubing slightly and by using successive 100 cakes, each having a smaller bore, the tubing is finally reduced to fit the arbor closely. I have found as a rule that this result can be accomplished by using three cakes but more may be used if desired. At the end of this operation the tubing is in the form 105 shown in Fig. 6, the end of the tubing adjacent the end 58 of the arbor not having been reduced to any material extent because the holes in the leaden cakes have been enlarged by the cakes being forced over the enlarged 110 portion of the arbor.

It will be observed that the arbor between the points 48 and 50 is approximately five one thousandths of an inch less in diameter 115 than between points 50 and 52, but I have found that the pressure exerted by the leaden cakes will reduce the tubing to the arbor between the points 48 and 50 even though the cakes have first passed over the larger part of the arbor between points 50 and 52. 120

After the tubing has been fitted to the arbor it is cut annularly at the groove 62 and the arbor is then driven out of the tubing at the groove end by grasping the tubing with one hand and striking the end 60 of the arbor on a solid support. I have also found that there is sufficient elasticity in the tubing so that even when the part of the 125 130

arbor between points 50 and 52 has been pushed through the part of the tubing between 48 and 50, that after the arbor is out that part of the tubing between 48 and 50 will return to its reduced size.

After the tubing has been removed from the arbor the portion of the tubing between points 40 and 44 is next reduced to form the joint by placing that end through a metal die 64 having a central bore 66; the bore being beveled at 68 to receive the end of the tube. This operation may be performed in any suitable manner, such, for instance, as placing the die in a lathe and then forcing the tubing through the die into the position shown in Fig. 9. This reduces that end of the tubing to the diameter desired for the joint.

In order to drive the tubing out of the die I provide a suitable plug having a head 70 and a central extending portion 72 adapted to be inserted within the tubing in the die as shown in Fig. 9. The die, tubing and plug are then mounted in an ordinary lathe with the tail-piece 74 of the lathe in engagement with the head of the plug 70 and the head-piece 76 of the lathe in engagement with the die. A spindle in the lathe is then turned to cause the tail-piece to approach the head-piece, thereby forcing the die to the end of the tubing from which it may be easily removed. The head-piece is then ready to be finished by having one end provided with a thread to receive the cap 28 and being bored on one side to form a mouth-piece hole and receive the embouchure.

As heretofore stated, the scale of curvature of the head-piece is exaggerated in the drawings to better illustrate the main feature of my invention. It will be observed that between the embouchure and the enlarged portion of the head-piece, the bore is slightly less in diameter than the constant diameter of the bore of the joint of the head-piece and the bore of the body-portion of the piccolo. With a head-piece of this formation, I have secured in a metallic piccolo, results which, so far as I am informed, have never before been attained in a musical instrument of this character.

The fact that the entire register of my piccolo can be played with flute fingering is a decided advantage because it obviates the cross-fingering now required for the high notes in playing piccolos having a conical bore. It is a well known fact that in orchestras and bands one musician plays

both the piccolo and the flute, playing first one and then the other as the exigencies of the music require, and it is especially desirable for the musician to be able to play both instruments with the same fingering.

Another advantage of my piccolo is that, owing to the ease of blowing, the high notes may be easily produced and sustained for much longer periods of time than is now possible with the conical bore piccolo and such notes are of better tone and intonation thereby harmonizing more perfectly in orchestral and band work.

What I claim is:—

1. In a piccolo, the combination of a body-portion having a cylindrical bore and a head-piece having an enlarged portion adjacent the joint end, said enlargement extending from the joint end to a point approximately half-way between the joint and the embouchure.

2. A piccolo comprising a body-portion having a cylindrical bore and a head-piece having an enlarged portion adjacent the joint end.

3. A piccolo comprising a body-portion having a cylindrical bore and a head-piece having an enlarged portion adjacent the joint end and extending to a point approximately half way between said joint-end and the embouchure; the diameter of said enlargement increasing abruptly adjacent the joint end then slightly to a point near the center of said enlargement and then decreasing gradually.

4. A piccolo comprising a body-portion and a head-piece; said head-piece having an enlarged portion adjacent the joint end extending to a point approximately half way between said joint end and the embouchure, the diameter of said enlargement increasing abruptly adjacent the joint end then slightly to a point near the center of said enlargement and then decreasing gradually.

5. A head-piece for a piccolo having an enlarged portion adjacent the joint end and extending from said joint end to a point approximately half way between said joint end and the embouchure, the diameter of said enlargement increasing abruptly adjacent the joint end then increasing slightly and gradually to a point near the center of said enlargement and then decreasing gradually to a point substantially half way between said joint end and the embouchure.

In witness whereof, I hereunto set my hand this sixteenth day of June, 1919.

NILS CHRISTENSEN.