

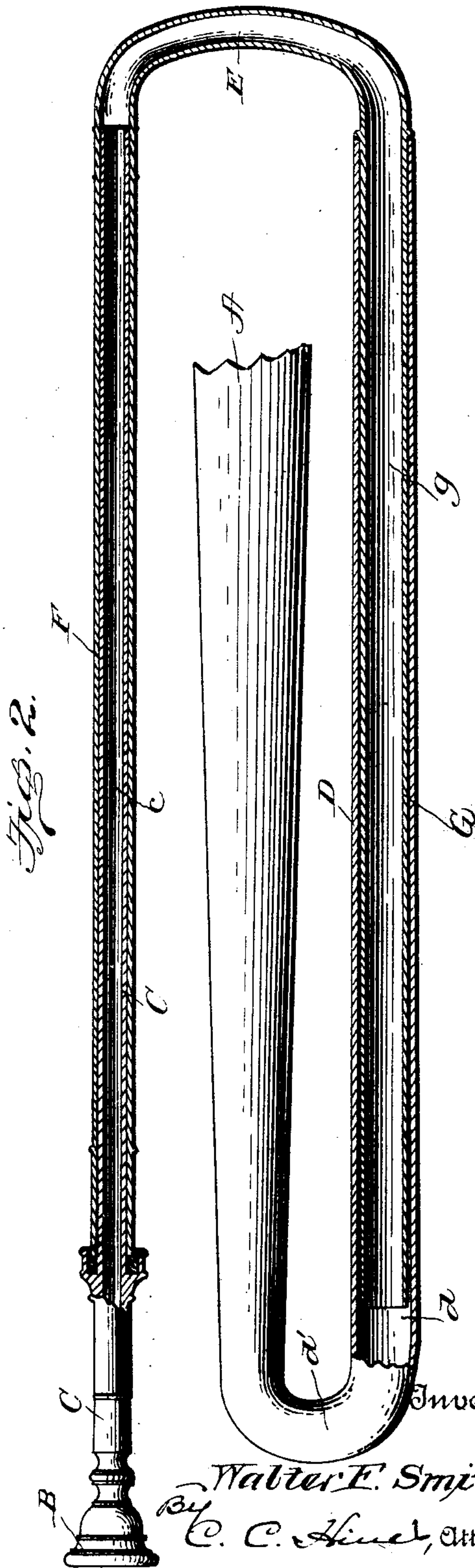
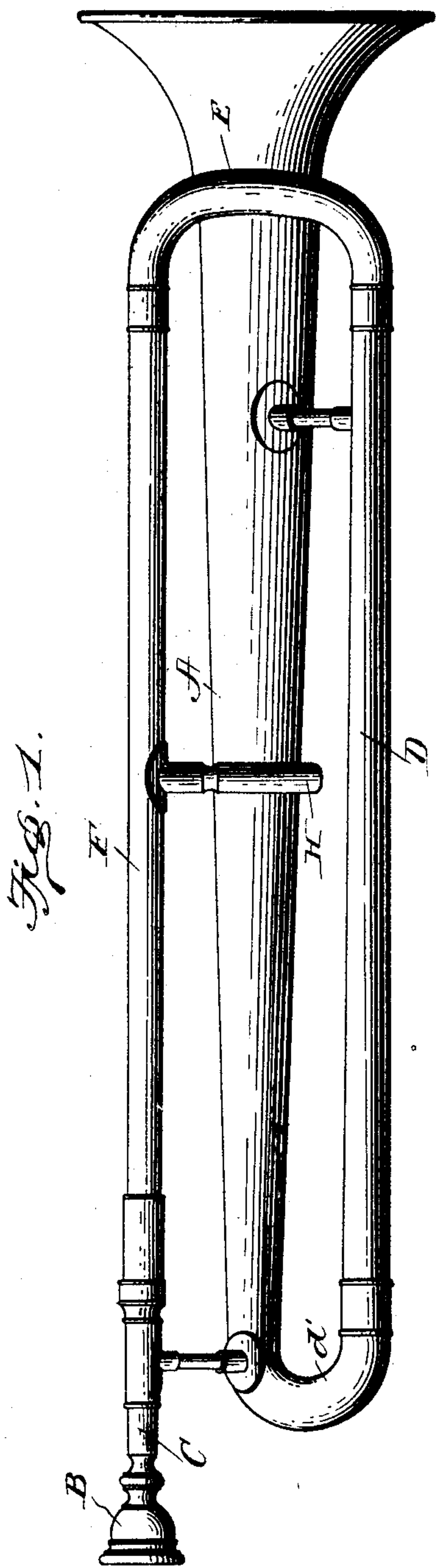
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W. F. SMITH.
WIND MUSICAL INSTRUMENT.

(Application filed Jan. 8, 1901.)

(No Model.)



Witnesses
S. O. Hunt,
J. A. Griesbauer Jr.

Inventor
Walter F. Smith,
By *C. C. Hunt,* Attorney.

UNITED STATES PATENT OFFICE.

WALTER F. SMITH, OF WASHINGTON, DISTRICT OF COLUMBIA.

WIND MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 671,060, dated April 2, 1901.

Application filed January 8, 1901. Serial No. 42,510. (No model.)

To all whom it may concern:

Be it known that I, WALTER F. SMITH, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Wind Musical Instruments; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in wind musical instruments, and particularly to instruments of that character wherein the notes of the chromatic scale are produced through the instrumentality of a slide.

The objects of the invention are, first, to construct and arrange the parts of the instrument in a novel manner, as hereinafter described and claimed, so as to diminish the leakage of air between the tubes of the slide and the fixed tubes of the instrument at the points where they overlap, and thereby to prevent the injury to the tone quality which would ensue from such leakage and insure the production of full and clear tones; second, to obtain more nearly the proper flare and proportions of bore necessary throughout the instrument to secure maximum power with perfection of tone quality and intonation, and, third, to provide for the effective balancing of the slide to prevent the same from sagging and binding upon the fixed air-tubes of the instrument.

With these and other objects in view, which will appear as the nature of the improvements is better understood, the invention consists, substantially, in the novel construction, combination, and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims.

In the drawings, Figure 1 is a view in side elevation of a musical instrument embodying my invention. Fig. 2 is a longitudinal sectional view, on an enlarged scale, of the slide and coöperating air-tubes of the instrument.

In trombones and other similar musical instruments of the type to which my invention

relates it has been the invariable practice heretofore to arrange the upper and lower tubular branches of the chromatic slide—that is, the movable part of the instrument—to inclose and slide upon the upper and lower fixed air-tubes of the instrument connecting said slide with the mouthpiece and bell. This is objectionable, for the reason that it is practically impossible to prevent the leakage of air if, by reason of wear or improper fitting, any space or crevice exists between the tube connecting with the bell and the lower tube of the slide, since the inner end of said space or crevice will lie or extend directly in the path of the air flowing from the slide into the tube connecting with the bell and will afford a more or less ready means of escape. This is also to a great extent influenced by the contraction of the air in passing from the larger bore of the slide to the smaller bore of the air-tube connecting with the bell, whereby the current of air is checked at the junction of the tubes and a portion of the air forced to escape through the said crevice under the pressure of the inflowing air from the mouthpiece. The action of the air in thus contracting is also liable to cause the production of faulty sounds, owing to the lack of uniformity of the flow thereof, and at the same time seriously impairs the blowing qualities of the instrument both as to volume of tone and the correct intonation of the sounds produced. Furthermore, this old and well-known manner of mounting the slide is objectionable, for the reason that it is impossible to employ conic proportions except to a limited degree, the use of tubing having a cylindrical bore being, in the main, essential in order to secure the proper fitting of the slide on the fixed tubes of the instrument. The reason for this lies in the fact that as the lower overlapping tube of the slide limits the size of the air-column any interior contraction at the extremity of the lower fixed tube of the instrument would increase the obstruction to the free passage of the air and would therefore be impracticable. In slides of ordinary construction, wherein the hand-grip is located at the inner end of the slide, a further objection is found in that the slide when extended to its extreme limit tends to sag or drop at its outer end, thereby causing it to pinch or bind

on the fixed tubes of the instrument, such pinching or binding interfering with the free motion of the slide. My invention is designed to overcome these objections in a simple and effective manner and to provide a construction whereby the escape of air between the fixed tubes of the instrument and slide is entirely prevented or materially diminished, the tone quality, intonation, and power of the instrument materially increased, the use of tapered or conic-bore tubes permitted to a much greater degree than has heretofore been possible at the points where their use has been found by me to be most desirable and effective, and the perfect balancing and free motion of the slide secured.

In the drawings I have shown for purposes of illustration the application of the invention to a slide-trumpet, although it is to be clearly understood that it may also be applied to trombones and other instruments to which the invention is or may be found susceptible of application. Hence I do not limit the invention to use in connection with any particular type of musical instrument employing a slide, but reserve the right to use it in connection with any form or type of instrument to which it is now or may hereafter be found applicable.

Referring now more particularly to the drawings, A represents the bell of the trumpet or instrument; B, the mouthpiece; C, the mouth tube or pipe extending from the mouthpiece; D, the lower tube or pipe leading to the bell, and E a U-shaped tube forming the chromatic slide, the upper and lower branches F and G of which are slidably connected to said tubes C and D. The tubes C and D may be rigidly or removably connected to the mouthpiece and bell, but for convenience of description are termed herein the "fixed" tubes of the instrument in contradistinction to the relatively movable tubes or branches of the slide.

In the ordinary construction of slide both branches of the slide are fitted to inclose or overlap and slide upon the tubes C and D, which is objectionable for reasons heretofore stated. In carrying my invention into practice I arrange the lower branch tube G of the slide to fit and move within the lower fixed tube D, but employ the ordinary arrangement of the upper branch tube F, which incloses and fits and slides, as usual, upon the upper fixed tube C. By this construction and arrangement of the tubes it will be seen that the air flowing through the instrument from the mouthpiece is caused to pass at all times from a tube or bore of relatively small diameter to a tube or bore of a larger diameter, whereby contraction of the air at the joints of the tubes is avoided and the obstruction to the free passage of the air caused in the ordinary construction of slide instrument at the extremity of the tube D wholly overcome, so that the blowing qualities of the instrument, both as to volume of tone and the cor-

rect intonation of the sounds produced, are materially enhanced and the production of full and perfect tones insured. Liability of leakage at the joints between the tubes is also materially diminished, as the ordinary arrangement of the tubes D and G is reversed, thereby causing the inlet to any space or crevice which may exist between said tubes, as the result of wear or improper fitting, to lie or extend oppositely to the path of travel of the column of air, which renders leakage at the joints unlikely, except in the event of back pressure, which, for reasons above set forth, my construction also tends to avoid.

Experience has demonstrated that the use of a conic bore, as far as practicable, throughout the entire instrument is desirable, since it facilitates the passage of the air through the instrument, and thereby improves both the volume and quality of the tone. Heretofore it has been found impracticable to use such a bore except to a limited extent in slide instruments, owing to the defects in construction before mentioned. The power and tone of the instrument have been improved by internally flaring the upper fixed tube C; but as heretofore constructed it has been impossible to extend the flare or conic formation to the lower tubes D and G, for the obvious reason that the flaring of the tube D would prevent the proper interfitting of the tubes and for the further reason that the increase in thickness of the tube D necessary to produce the proper flare would result in the closer contraction of the bore at the inlet end of said tube, thereby increasing the obstruction to the passage of the air instead of facilitating its flow. My construction entirely avoids this difficulty, as will be readily perceived by reference to Fig. 2. In addition to tapering or flaring the internal wall of the tube C to give the bore *c* a slight conic formation with its greatest width or internal diameter at the outer or eduction end of said tube I am also enabled to flare or taper both lower tubes D and G with the advantages of securing a much freer flow of air instead of the disadvantage of checking the course of the air, which would result from a corresponding formation of these tubes in instruments of ordinary construction. The degree of flare or taper employed may vary, but I preferably taper the internal walls of both tubes to a slight degree throughout their entire lengths and in the same direction, thereby making the bore *d* of the tube D, as well as the bore *g* of the tube G, of conic formation and disposing the larger end of the bore *d* at the inner end adjacent to the bend *d'*, which connects it with the bell A and the larger end of the bore *g* at the inner end or extremity of the tube G. By this construction it will be apparent that the resistance opposed in the ordinary cylindrical formation of tubes to the passage of the air through a bore of uniform or variable diameter is overcome and a much freer flow of the air insured. This results in the instrument being rendered

free blowing and increases to a great extent the power and tone quality, while insuring correct intonation and full and perfectly clear tones. The construction, furthermore, is such
5 that the conic-bore formation in the channel formed by the tubes D and G is preserved throughout the entire movement of the slide even when extended to its fullest limit. My construction therefore increases to a marked
10 degree the extent of conic-bore formation.

In order to secure the perfect balancing of the slide and to prevent sagging or dropping of the slide and the consequent binding of the tubes upon one another when the slide is extended to the limit of its outward movement,
15 I dispose the handpiece H at or about the center of the slide, which adapts it to act as a counterbalance in maintaining the fulcrum at the proper point to relieve the tube D of strain and prevent the tendency of the slide
20 to tilt and sag when moved outward to its full extent. This prevents pinching and binding of the tubes upon one another and adapts the slide to move freely through its entire extent
25 of movement in both directions. This action is furthermore promoted by the arrangement of the tube D within the tube G, as it is thereby adapted to overcome or counteract any tendency of the tube F to cant and pinch the
30 tube C when the slide is extended.

From the foregoing description, taken in connection with the accompanying drawings, the construction, mode of operation, and advantages of my invention will be readily understood, and it will be seen that the construction of the slide is such that the air in passing through the instrument always passes
35 from an inner tube into an outer or overlapping tube, which renders leakage at the joints unlikely, except in the event that the current
40 of air turns back upon itself, which as there is no back pressure upon the air within the instrument is not liable to occur.

It has been proven by the experience of
45 players and manufacturers of musical instruments of this class that modifications of the bore varying from the cylindrical form are desirable to secure power of tone, a full resonant quality, and the perfect intonation of
50 the several notes produced by the same position of the slide. I am of the opinion that the proper proportions of the bore can only be obtained in my construction of slide, for the reason that in other constructions the air in
55 passing through the instrument invariably at some point passes from an outside tube into an inner tube, a circumstance which renders any other than a cylindrical form of tubing impracticable in this portion of the instrument and also forms a defective joint. These
60 difficulties are obviated without the use of packing or other extraneous means in my

slide, where in every instance the air passes from an inner into an outer or overlapping tube.

I may arrange the slide to extend to the fourth, fifth, sixth, or seventh position, or further, if desired, to correspond to the range of movement of the chromatic slides in ordinary use. I may also make the slide either
70 single, as shown, or double, the double slide constituting a duplication of the present structure, with the addition of suitable connecting means.

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

1. A wind musical instrument of the character described, having a bell, a mouthpiece, air-tubes connecting with the bell and mouth-
80 piece, and a U-shaped slide having its branches sliding, respectively, upon the air-tube connecting with the mouthpiece and within the air-tube connecting with the bell, substantially as described.

2. A wind musical instrument of the character described, having a bell, a mouthpiece, air-tubes connecting with the bell and mouth-
85 piece, and a U-shaped slide having its branches sliding, respectively, upon the air-tube connecting with the mouthpiece and within the air-tube connecting with the bell, the said air-tube connecting with the bell and the cooperating tube of the slide being provided with flared or conic bores, substantially
90 as described.

3. A wind musical instrument of the character described, having a bell, a mouthpiece, air-tubes connecting with the bell and mouth-
95 piece, and a U-shaped slide having its branches sliding, respectively, upon the air-tube connecting with the mouthpiece and within the air-tube connecting with the bell, the said air-tubes connecting with the mouthpiece and bell and the tube of the slide cooperating with the latter-named air-tube being provided with flared or conic bores, substantially as described.

4. A wind musical instrument of the character described, having a bell, a mouthpiece,
100 air-tubes connecting with the bell and mouthpiece, a U-shaped slide having its branches sliding, respectively, upon the air-tube connecting with the mouthpiece and within the air-tube connecting with the bell, and a hand-
105 piece connected to and arranged at or about the center of the slide, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WALTER F. SMITH.

Witnesses:

JOSEPHINE G. FERNALD,
H. K. SIMPSON.