No. 784,201. PATENTED MAR. 7, 1905.

C. H. BARRETT.

BRASS BAND INSTRUMENT.

APPLICATION FILED DEC. 12, 1902.

3 SHEETS—SHEET 1.

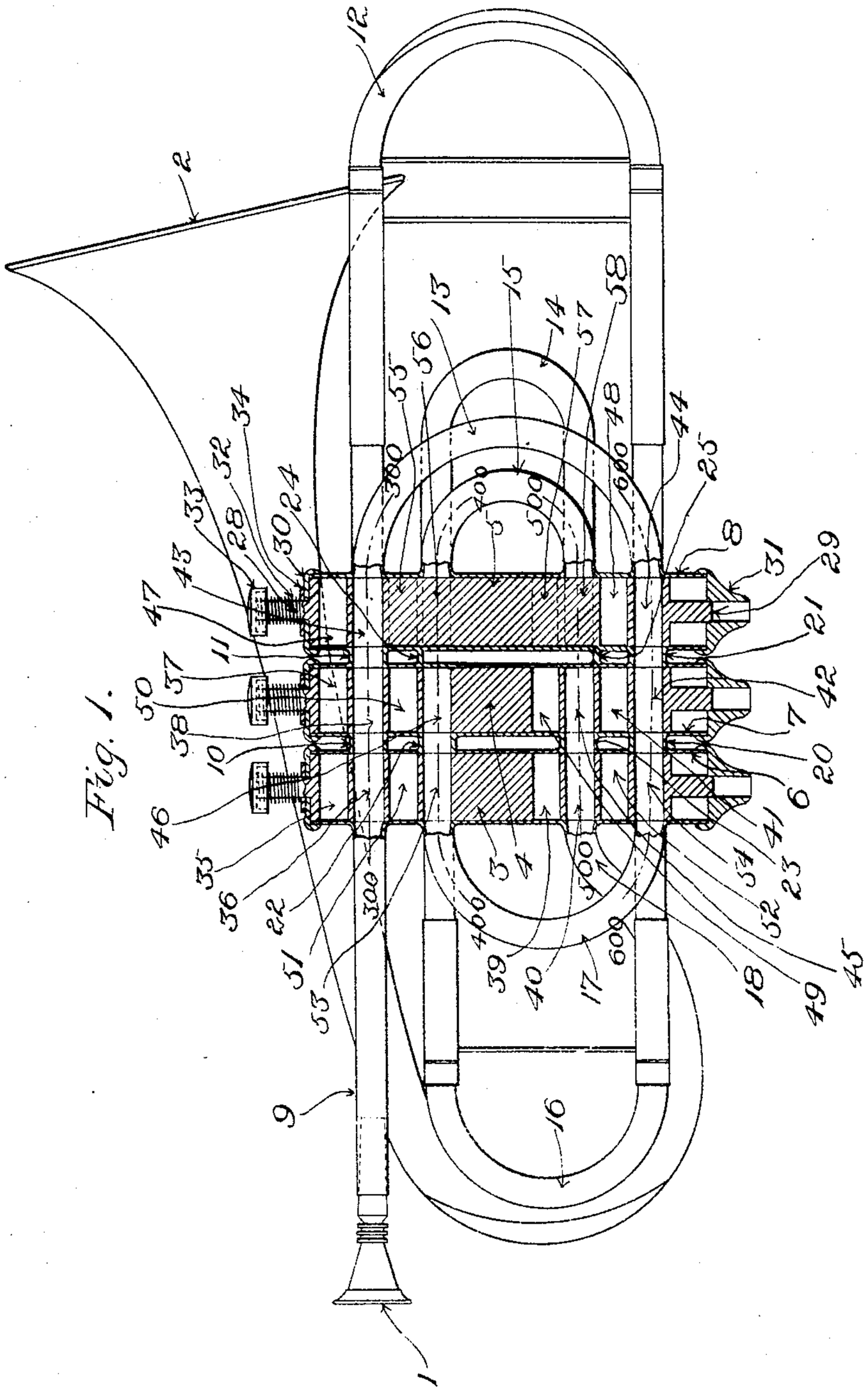

Fig. 1.

Witnesses:
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3 SHEETS—SHEET 2.

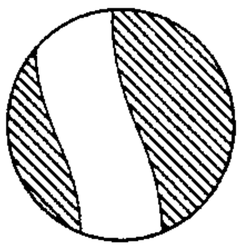

Fig. 9.

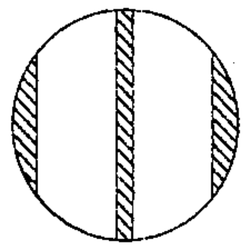

Fig. 12.

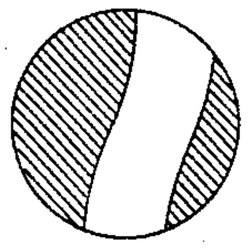

Fig. 8.

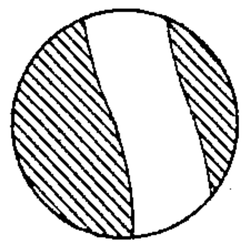

Fig. 11.

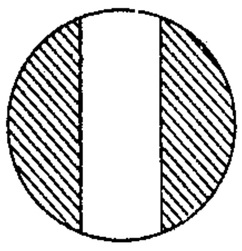

Fig. 7.

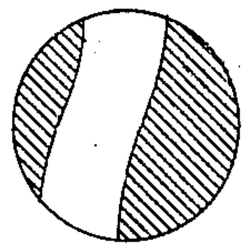

Fig. 10.

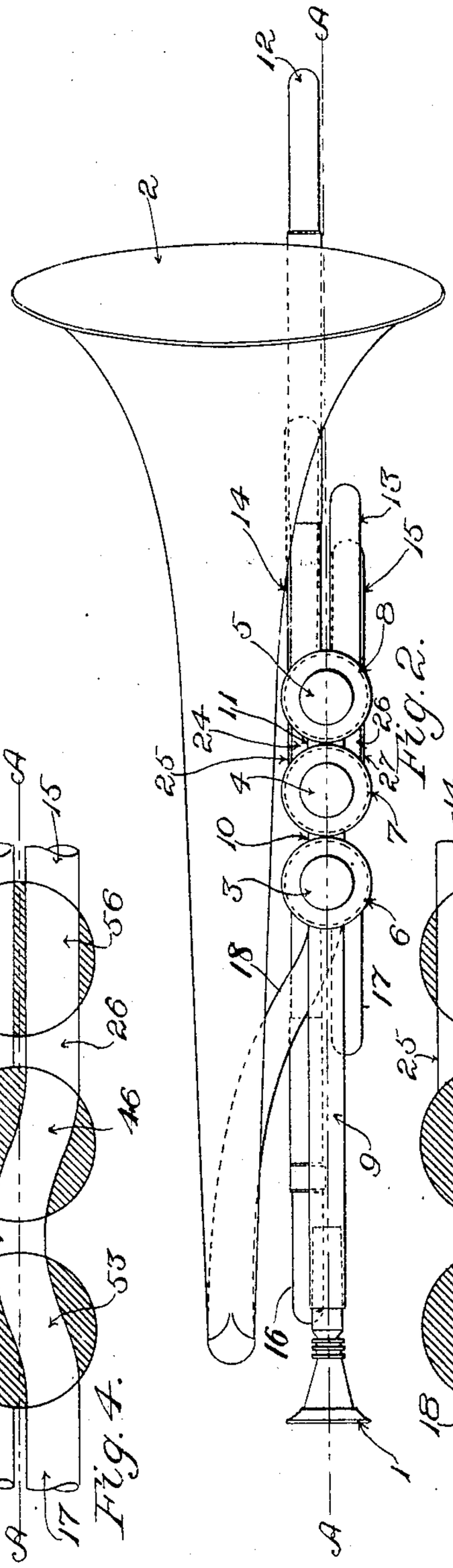

Fig. 2.

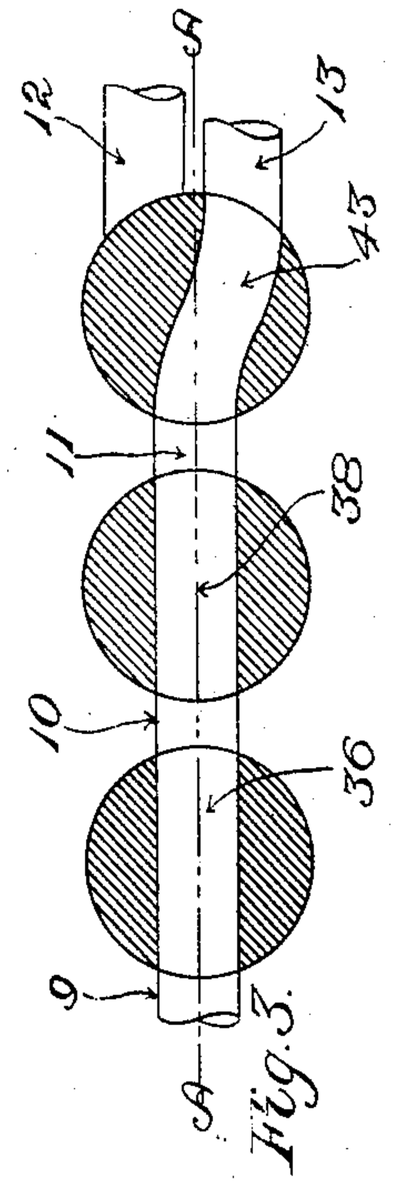

Fig. 3.

Fig. 4.

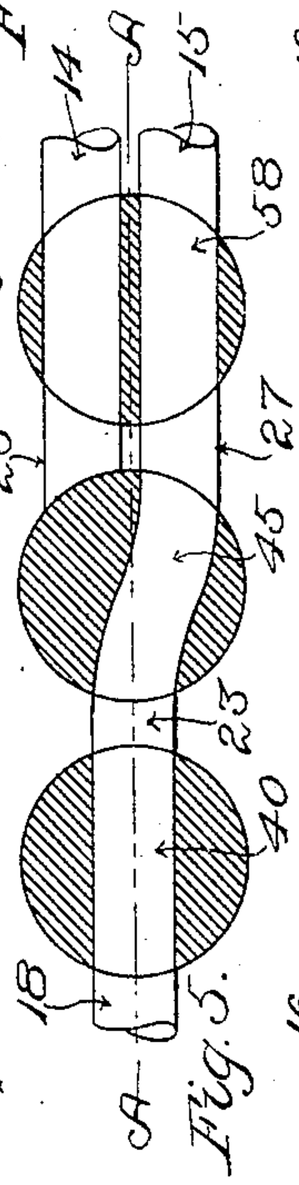

Fig. 5.

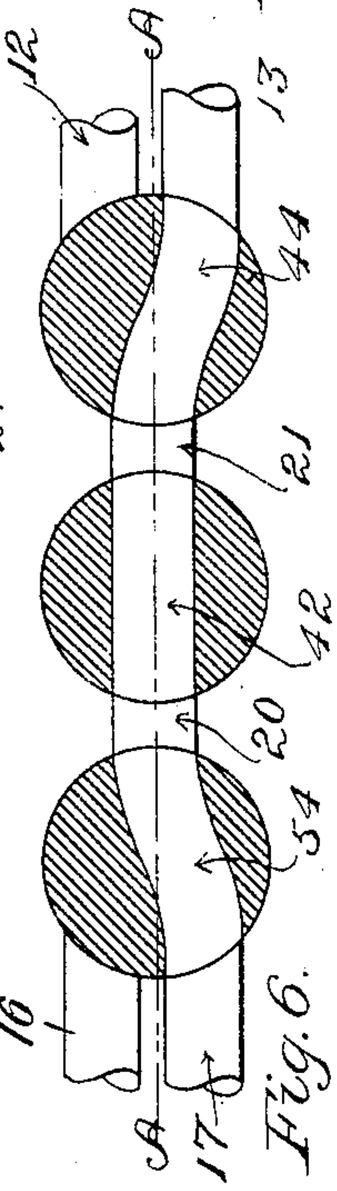

Fig. 6.

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3 SHEETS—SHEET 3.

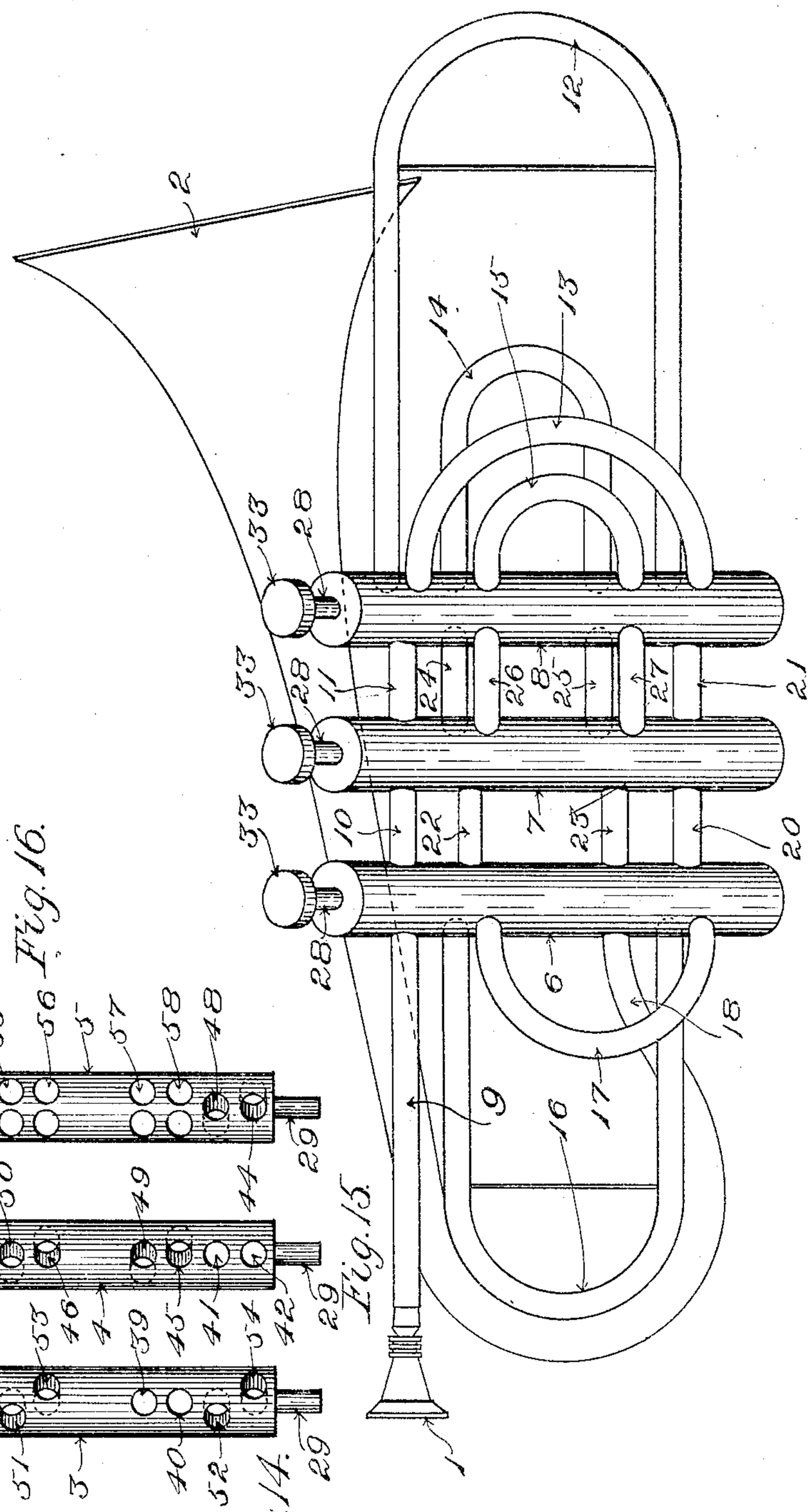

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

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No. 784,201 Patented March 7, 1905.

UNITED STATES PATENT OFFICE.

CLINTON H. BARRETT, OF BOSTON, MASSACHUSETTS.

BRASS BAND INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 784,201, dated March 7, 1905.

Application filed December 12, 1902. Serial No. 134,888.

To all whom it may concern:

Be it known that I, CLINTON H. BARRETT, a citizen of the United States, residing at Boston, in the county of Suffolk, State of Massachusetts, have invented a certain new and useful Improvement in Brass Band Instruments, of which the following is a specification, reference being had therein to the accompanying drawings.

In a brass band instrument the length of pipe which contains the vibrating column of air affects the pitch of the tone, the size, thickness, and taper of the pipe affecting only the character of the tone.

Upon any given length of pipe in an instrument there may be produced by varied tension of the lip, two tones of the natural scale—namely the first and fifth tones and their octaves; but to produce the remaining tones of the scale a change in the length of the pipe becomes necessary. In many instruments the change of pipe length is produced by means of valves and the tones resulting from such changes are called "valve-tones." In the usual type of brass band instrument employing valves for the purpose of changing the tones by altering the pipe length three valves are used. The first adds to the original pipe length, so as to change the pitch to the amount of one tone. The second changes the pitch to the amount of one-half tone, and the third to the amount of the other two combined—that is, a tone and a half. These three valves used separately and in combinations will give all the different lengths of pipe, which together with varied tension of the lip are required to enable the performer to produce in addition to the first and fifth tones, or open tones, which he can produce upon the original length of pipe, all of the tones and half-tones which go to make up the chromatic scale.

It is a fact well known to musicians that as brass band instruments are usually constructed the use of valves for altering the pipe length of the same, and thereby producing the so-called, "valve-tones," necessitates the addition to the instrument of several short pipe lengths with sharp crooks and bends therein. As previously stated, the quality of the tone of the instrument is dependent to a certain extent upon the straightness of the path of the vibration. My construction enables me to make the path of vibration as nearly straight as may be in an instrument having the tube bent upon itself. These tend not only to complicate the instrument in its construction, but also to compel the sound-producing vibrations to traverse the pipe length having a passage of a very tortuous character. As a result there is a marked deterioration in the quality of the valve-tones as compared with the tones produced on the open pipe and it is also more difficult to produce the tones.

My invention is designed to avoid these objectionable features just mentioned and to produce an instrument in which the valve-tones are of substantially the same quality as the open tones, and I aim to produce this desired result by causing the valves to effect the change of pipe length without increasing or changing at any time the number of convolutions or turns in the pipe or necessitating the employment of short bends or crooks therein.

The manner in which I carry out my invention consists in so constructing the instrument that each of its valves in one position causes the vibrations of air in the instrument to traverse the shorter of two similar branches of pipe and in its other position to traverse the longer of the said pipe branches. These branches are identical in size and curvature and differ only in the length of straight pipe contained therein. Thus the vibrations of the air-column within the pipe in either position of the valve take place in pipes identical in every respect except as to length, and in consequence there is no difference in the ease of production of tone or in the qualities of the tones produced by either.

The construction adopted to carry out my invention I will now proceed to describe with reference to the accompanying drawings, in which latter—

Figure 1 shows an instrument embodying my invention in side elevation, showing the valve-tubes in section. Fig. 2 shows the same in plan. Fig. 3 is a section taken on the line

300 300, Fig. 1. Fig. 4 is a section taken on the line 400 400, Fig. 1. Fig. 5 is a section taken on the line 500 500, Fig. 1. Fig. 6 is a section taken on the line 600 600, Fig. 1. Figs. 7 to 12 show the different kinds of passages with which the valve plungers or pistons are provided. Figs. 3 to 12 are on a larger scale than are Figs. 1 and 2. Fig. 13 is a view in perspective with the valve-tubes more widely separated for greater clearness. Figs. 14 to 16 show the passages in the valve-pieces as they appear when viewed from the mouthpiece.

In the drawings, 1 represents the mouthpiece, and 2 the bell of a brass band valve instrument embodying my invention, the said mouthpiece and bell being connected by the convolutions of pipe, as shown in Fig. 1, and more fully described hereinafter. To produce an instrument of a compact construction, the said convolutions of pipe lie as nearly as possible to the longitudinal plane which I have represented in Fig. 2 by the line A A, hereinafter called the "plane" of the instrument, or plane A A. The bell of the instrument is usually located at one side of the plane of the instrument, as shown in Fig. 2.

The valves by which the valve-tones are produced are indicated at 3, 4, and 5 and are interposed in the paths of the convolutions of pipe, the latter being soldered or otherwise fixed on the exteriors thereof, as will hereinafter be more particularly described. The said valves lie closely adjacent to each other, preferably with their axes parallel and lying in the plane of the instrument.

The valves may be constructed in any usual or well-known manner. Preferably they consist of cylindrical tubes 6 7 8, having lateral openings communicating with the interiors of the pipes which the valves control, the pipes being secured, preferably, by soldering upon the exteriors of the said valve-tubes so that their interiors register over the said openings. The pipes which are thus fixed upon the valve-tubes are as follows: A pipe 9, preferably having its axis in the plane A A, leads from the mouthpiece 1 to the valve-tube 6. Short connecting-pipes 10 and 11, also lying in the plane A A, unite valve-tubes 6 and 7 and 7 and 8, respectively. On the side of valve-tube 8 farthest from the mouthpiece are the pipes 12 and 13. One of these, 13, is attached to the valve-tube near the top of the same, and curves downwardly to its point of attachment near the bottom thereof, lying, as appears in Fig. 2 and Fig. 13, wholly to the right of the plane A A, the instrument being viewed from the mouthpiece end. The other pipe, 12, is attached to the valve-tube 8 at points lying closely adjacent to the points of attachment to the said valve-tube of pipe 13; but the said pipe 12 lies wholly to the left of plane A A and is longer than pipe 13, as will appear from Fig. 1 and Fig. 13.

The above description of the manner in which pipes 12 and 13 are attached to the valve-tube 8 will apply also to the pipes 14 and 15, except that they are much shorter in length than the pipes 12 and 13 and are attached to the valve-tube 8 nearer the central portion of its length. The pipe 15 is located wholly to the right of the plane A A and the pipe 14 wholly to the left of the same, and as usually constructed the pipes 14 and 15 lie inside the bends of pipes 12 and 13, respectively, although in Fig. 2 they are shown a little to one side of the same at the lower points of attachment.

The pipes 16 and 17 are attached in a similar manner to the valve-tube 6 on the side thereof nearest the mouthpiece 1 and the pipe 9. Of these pipes the shorter, 17, is located wholly on the right of the plane A A in Fig. 2 and the longer pipe, 16, is located on the left thereof. The pipe 18 leads from the valve-tube 6 to the bell of the instrument, as shown.

As has been before mentioned, short pipes 10 and 11, having their axes located in the plane A A, connect valve-tubes 6 and 7 and 7 and 8, respectively. In a similar manner pipes 20 and 21 afford communication between the valve-tubes 6 and 7 and 7 and 8, respectively, and pipes 22 and 23 connect the valve-tubes 6 and 7 at points lying nearer the middle portion of the lengths thereof.

At 24 25 26 27 are short pipes connecting the valve-tubes 7 and 8. (See Figs. 4 and 5.) Of these pipes 24 and 25 preferably have their axes substantially coincident with the axis of pipe 14 at its upper and lower points of attachment to the valve-tube 8, respectively, and pipes 26 and 27 have their axes substantially coincident with the axis of pipe 15 at its upper and lower points of attachment to the valve-tube 8, respectively. In other words, the said pipes are arranged in pairs so that 24 and 26 lie parallel and closely adjacent to each other, and also 25 and 27 lie parallel and closely adjacent to one another, the pipes 26 and 27, however, lying wholly to the right of plane A A, and the pipes 24 and 25 lying wholly to the left of the same.

Inside each valve-tube is a piston sliding freely longitudinally therein and centrally guided with respect to the same by means of cylindrical projections 28 and 29, located on the top and bottom thereof and working in bearings provided for the same in caps 30 and 31, fastened, respectively, on the top and bottom of the said tube. The pistons are held normally in their upper position, or that shown in Fig. 1, by means of compression-springs 32 interposed between fingering-caps 33, fastened on the upper projections 28 of the said pistons, and washers 34, resting on the caps 30. The pistons are prevented from rotating on their axes in the valve-tubes in which they are located in any of the usual manners—as, for example, by means of pins inserted in the

pistons and working in slots provided therefor in the valve-tubes. This feature of construction is well known, and the same is not therefore shown in the drawings.

The valve-pistons are traversed by passages by which the pipes at the opposite side of the tubes may be put into communication with each other. These passages are of the six different types shown in Figs. 6 to 11, the diameter of each passage being substantially that of the internal bore of the pipe which is used in the construction of the instrument.

Passages of the type shown in Fig. 7 traverse the valve-piston substantially diametrically. The passages 35, 36, 37, 38, 39, 40, 41, and 42 are of this character. The axes of passages of the type shown in Figs. 8 and 9 are located on the diameter of the valve-piston at the point in the periphery thereof nearest the mouthpiece, but the passages turn to the right or to the left, respectively, so that on the opposite side of the piston it lies wholly to the right or to the left of the plane A A. The passages at 43, 44, 45, and 46 are of the type shown in Fig. 8 and those at 47, 48, 49, and 50 are like those shown in Fig. 9. The passages shown in Figs. 10 and 11 are similar to those shown in Figs. 8 and 9, but differ therefrom in that the passage is diametrically located in the piston at the point on its periphery nearest the bell end of the instrument and turns toward the right or to the left of the same as one faces toward its mouthpiece. The passages at 51 and 52 are of the character shown in Fig. 10 and those at 53 and 54 are like those shown in Fig. 11. The passages at 55, 56, 57, and 58 (see Figs. 1, 4, and 5) are of the double type, which is also shown in Fig. 12—that is, there are two passages substantially parallel, each lying wholly on one side of the diameter of the valve-piston and having the distance between the axes of the passages substantially the same as that between the axes of the pipes 14 and 15.

The ends of the passages in the piston described above are so located therein that in the extreme upper and lower positions of the piston they are adapted to register with the openings in the valve-tubes, with which openings the pipes are connected, as is above set forth.

The manner in which the pipe length of the instrument is controlled by means of the valves may be best understood by tracing the course followed by the vibrations in the pipes for the different positions of the valves. In the following description the terms "right" and "left," respectively, mean to the right or left of a person as he stands facing in the direction in which the vibrations are proceeding at the particular position in the instrument then under consideration.

The open tone of the instrument is that given forth by the instrument when the valve-pistons are in their uppermost positions, as in Fig. 1. In this position the vibrations start from the mouthpiece 1 and pass through pipe 9, passage 36, and pipe 10 to passage 38 and pipe 11 into passage 43. Here they are diverted toward the right and enter the downwardly-curving pipe 13, by which they are returned into the passage 44. The course of the vibrations from pipe 9 to pipe 13 is shown in Fig. 3. In passage 44 they are diverted toward the right to the pipe 21, which has its axis centrally located in the plane A A of the instrument, thence to the passage 42 and the pipe 20. Next entering the passage 54 the vibrations are again diverted, this time to the left into the pipe 17, which curves upwardly and communicates with passage 53. Fig. 6 shows the course of the vibrations from pipe 13 to pipe 17. In passage 53 the vibrations are rediverted toward the left to the center or plane A A of the instrument and emerge from the said passage into the pipe 22. They then proceed into the passage 46, which diverts them to the right into the pipe 26, right-hand member of the double passage 56, and into the downwardly-extending pipe 15. The course followed by the vibrations in passing from pipe 17 to pipe 15 is shown in Fig. 4. Pipe 15 leads the vibrations into the left-hand member of the double passage 58 and through pipe 27 to passage 45. Here the diversion of the passage 45 to the right returns them to the centrally-located pipe 23, and then they proceed through the passage 40 to the pipe 18, which extends to the bell of the instrument. Fig. 5 shows the course followed by the sound-vibrations in passing from pipe 15 to pipe 18. If now the piston of valve 5 be depressed, the passages 47 and 48 will occupy the positions in which passages 43 and 44 are shown in Fig. 1. Passage 47 will then receive the vibrations from pipe 11 and divert them to the left into pipe 12. They will then traverse the pipe 12 and be returned into passage 48, which will in the depressed position of valve 5 occupy the position in which passage 44 appears in Fig. 1. This passage 48 will divert the vibrations to the left into pipe 21, whence their course to the bell of the instrument will be the same as that described above, it being further noticed that the passages 55 and 57 will then be in the position in which Fig. 1 shows passages 56 and 58, respectively. Assuming valve 3 to be pressed down, the vibrations passing through pipe 20 will be diverted by passage 52, which will then occupy the position in which passage 54 appears in Fig. 1, toward the right, so as to enter pipe 16. Traversing this pipe they will enter passage 51, which the depression of the valve-piston will have put into position to receive the vibrations as they leave the pipe 16. In the said passage 51 the vibrations will be returned to the centrally-located pipe 22 and proceed thence to the bell of the instrument, following the course point-

ed out in a previous part of this specification. Finally, if the piston of valve 4 be pressed down, so that passages 49 and 50 are placed in the positions occupied by passages 45 and 46, respectively, the sound-vibrations from pipe 22 are diverted to the left and proceed through pipe 24 and the left-hand passage at 56 to the pipe 14. Passing through pipe 14 and the right-hand passage at 58 the vibrations are returned to pipe 25 and then enter passage 49, where they are returned to the pipe 23. They thence proceed, as above pointed out, to the bell of the instrument.

Bearing in mind the facts that passages 35 and 36, 37 and 38, 39 and 40, 41 and 42 are of the same character and that the double passages at 55, 56, 57, and 58 are also of the same character, it will be seen that each valve can be operated to produce its own peculiar effect without interfering with the passage for the tone-vibration through the valve at any of the points where it is incidentally required. Thus it will result that each valve may be operated separately or in any combination with any other valve or valves.

The pipe 14 is longer than the pipe 15 to such an amount that a note will be produced one-half tone lower than that produced by pipe 15. Similarly, when the vibrations traverse pipe 16 its increased length as compared with pipe 17 will produce a note one tone lower than that produced when the vibrations traverse pipe 17. In like manner pipe 12 will give a note one tone and one-half lower than pipe 13. Hence it will be clear that by using the valves separately or in combination it will be possible to produce upon the instrument all of the notes which in addition to the open tones go to make up the chromatic scale. Tuning-slides for the valves and for the instrument are provided of the usual types.

What I claim is—

1. A brass band instrument having pipes each of a different length arranged in pairs for producing different tones, the respective members of said pairs being situated in planes parallel with the vertical plane passing through the axis of the instrument and on opposite sides thereof, and valves adapted to divert the tone-vibration to either pipe of said pairs of pipes, respectively, to produce thereby change in tone, substantially as described.

2. A brass band instrument having pipes of different lengths arranged in pairs for producing different tones, the respective members of said pairs being situated in planes parallel with the vertical plane passing through the axis of the instrument on opposite sides thereof, and valves having their axes in the said plane and adapted to divert the tone-vibration to either pipe of said pairs of pipes, respectively, to produce thereby change in tone, substantially as described.

3. A brass band instrument having pipes of different lengths arranged in pairs for producing different tones, the respective members of said pairs being situated on opposite sides of the vertical plane passing through the axis of the instrument, and valves offsetting the line of direction of the tone-vibration and continuing it in a direction substantially parallel with its original direction, but at one side of said original line of direction, thereby effecting the substitution of a different length of pipe and producing a corresponding change of tone, substantially as described.

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

CLINTON H. BARRETT.

Witnesses:

WM. A. MACLEOD,

ALICE H. MORRISON.