

No. 745,804.

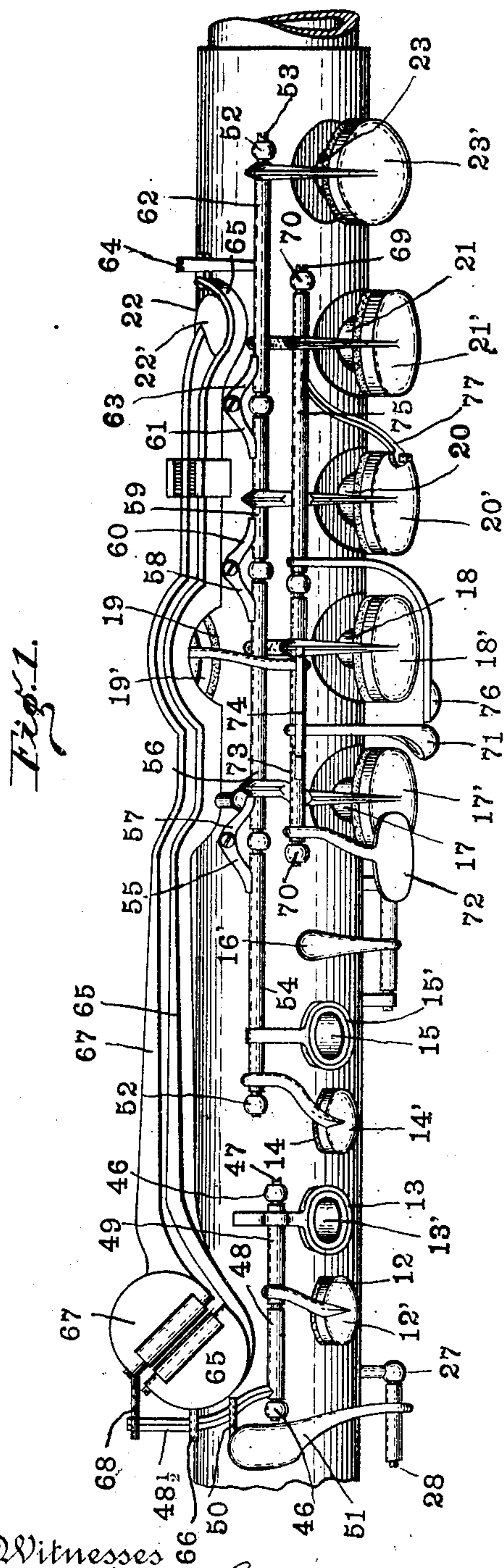
PATENTED DEC. 1, 1903.

L. M. ELLIS.
WIND INSTRUMENT.

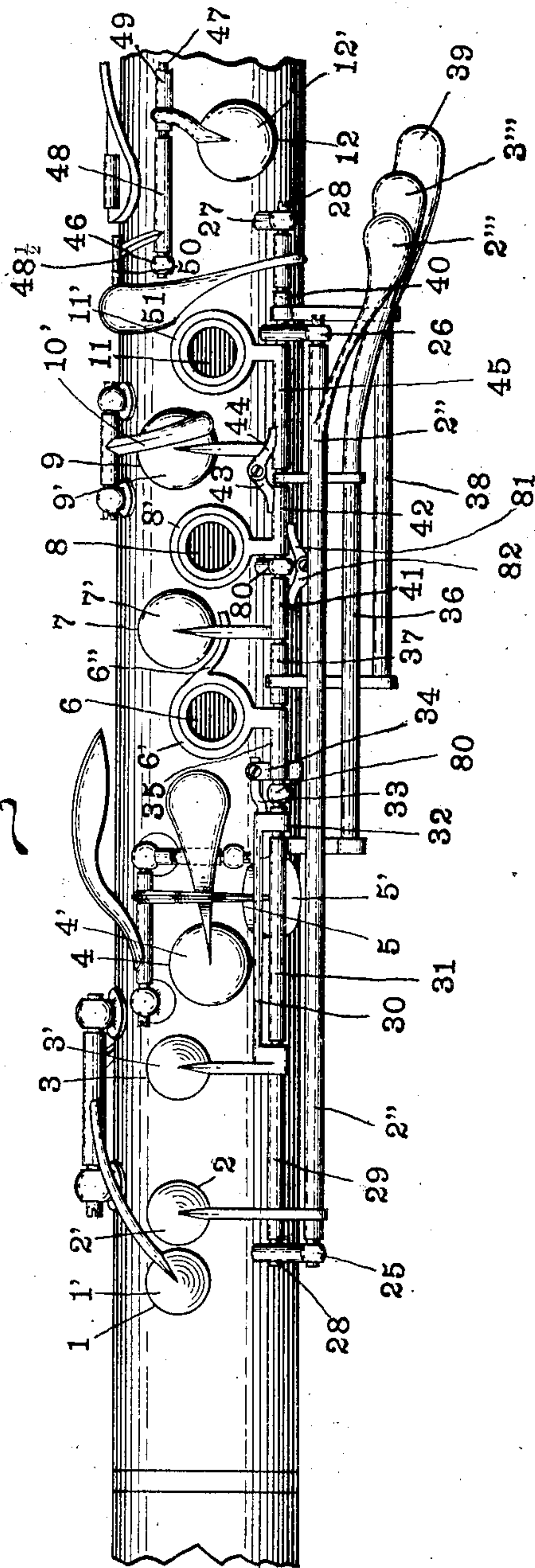
APPLICATION FILED AUG. 8, 1901.

NO MODEL.

3 SHEETS—SHEET 1.



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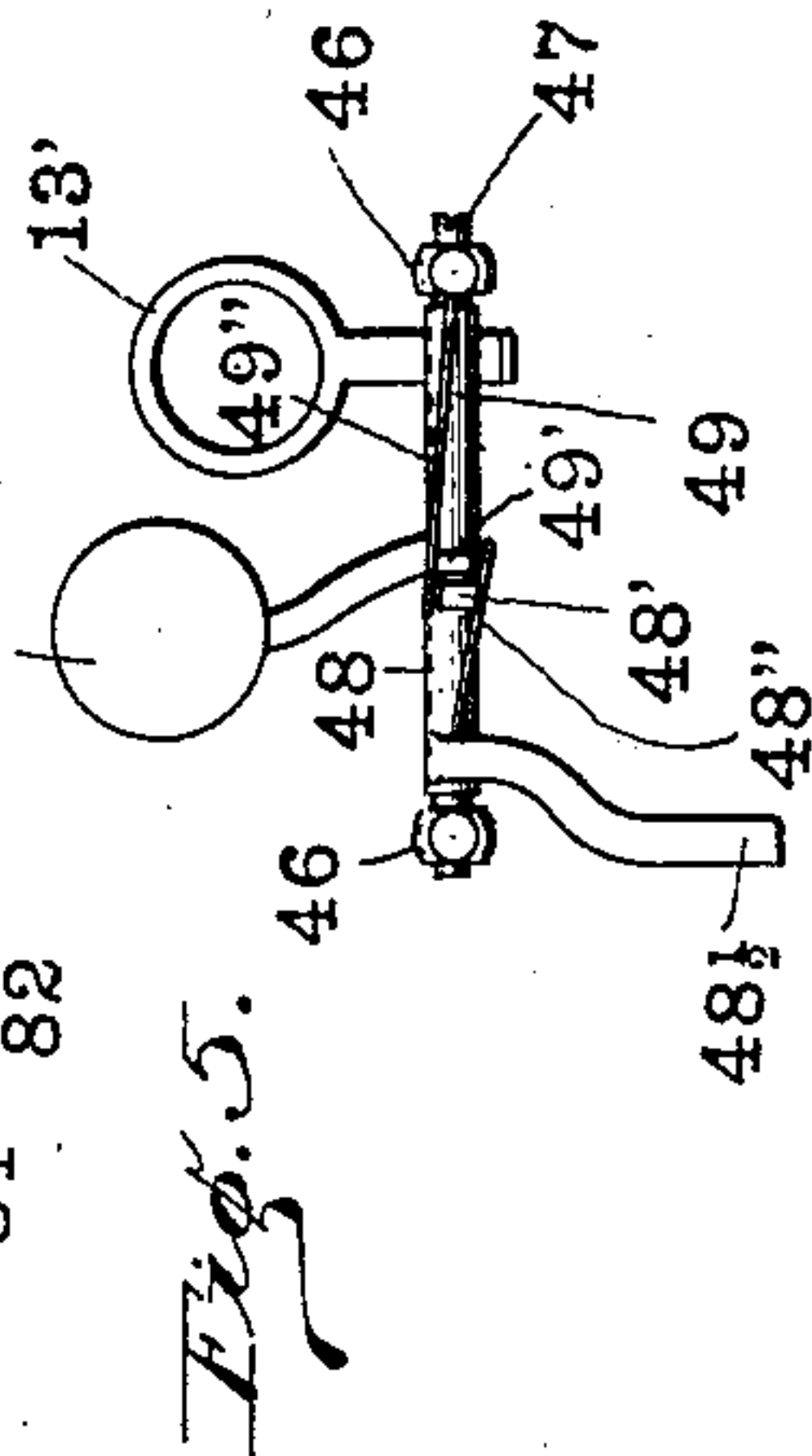
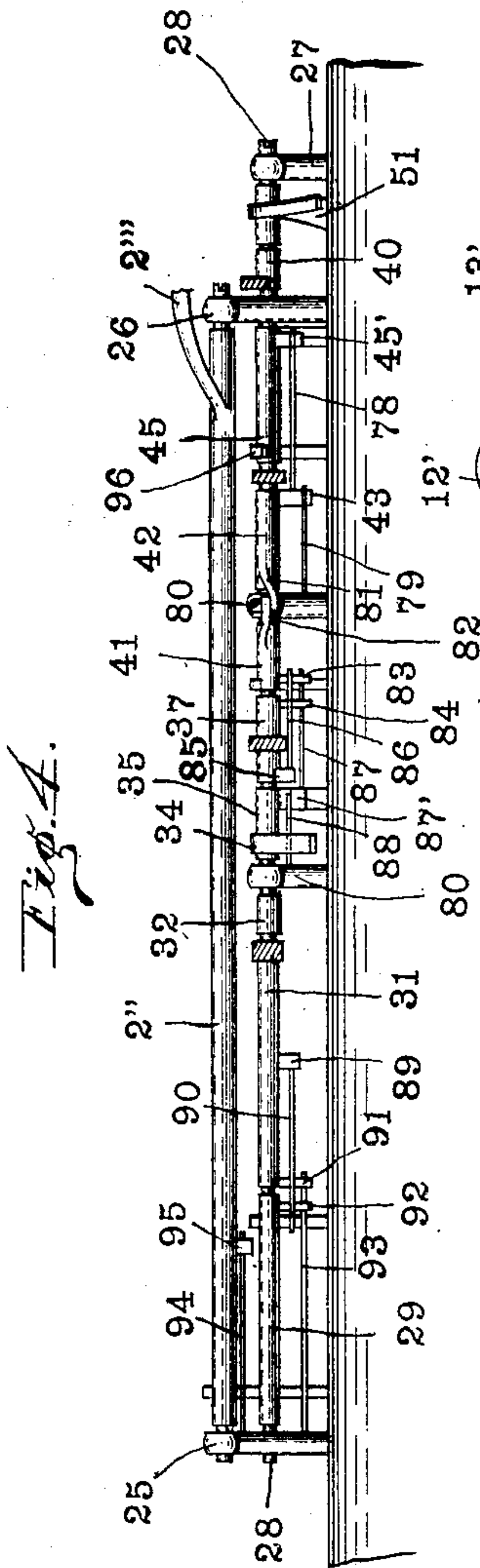
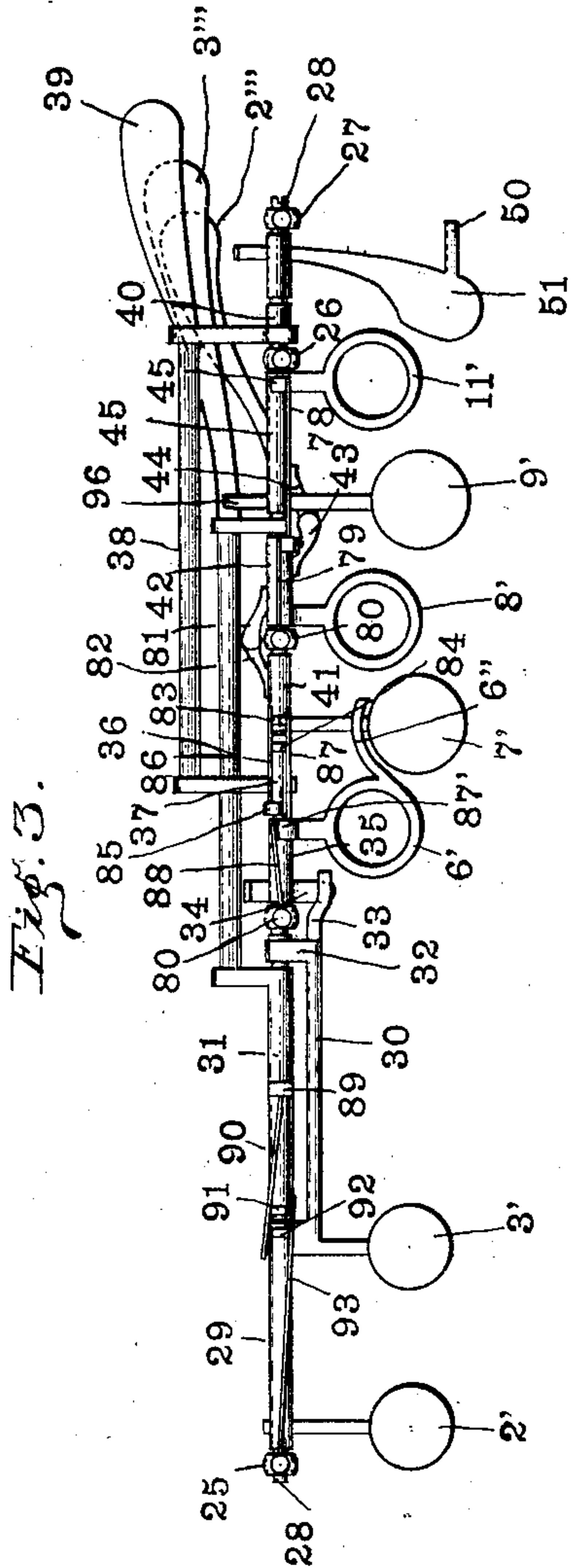
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NO MODEL.

3 SHEETS—SHEET 2.



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WIND INSTRUMENT.

APPLICATION FILED AUG. 8, 1901.

NO MODEL.

3 SHEETS—SHEET 3.

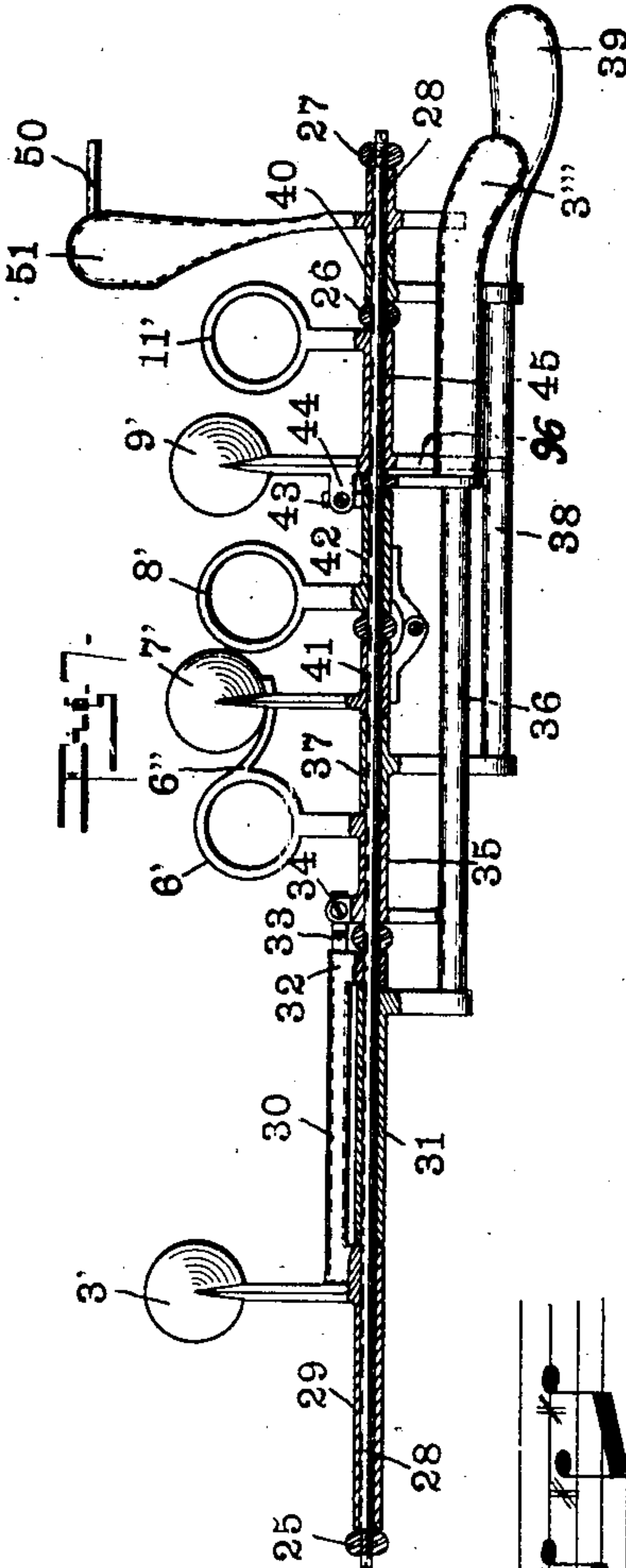
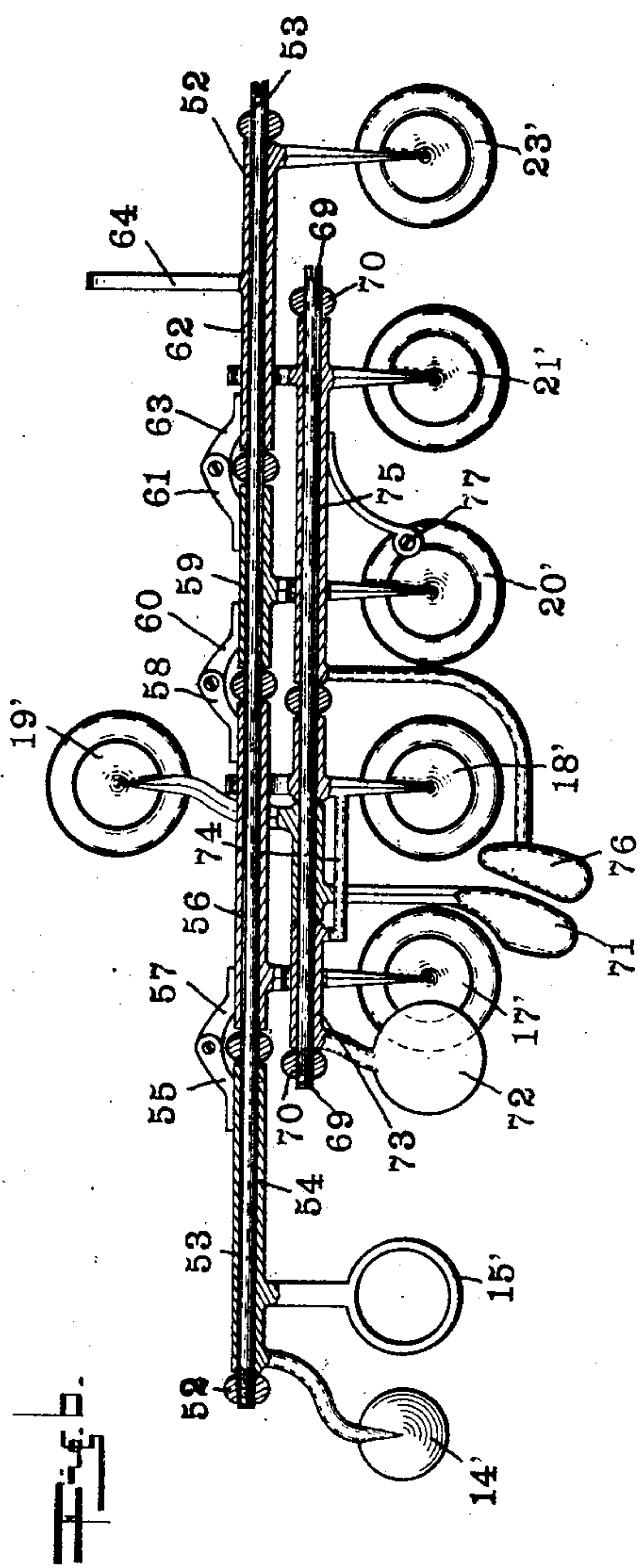
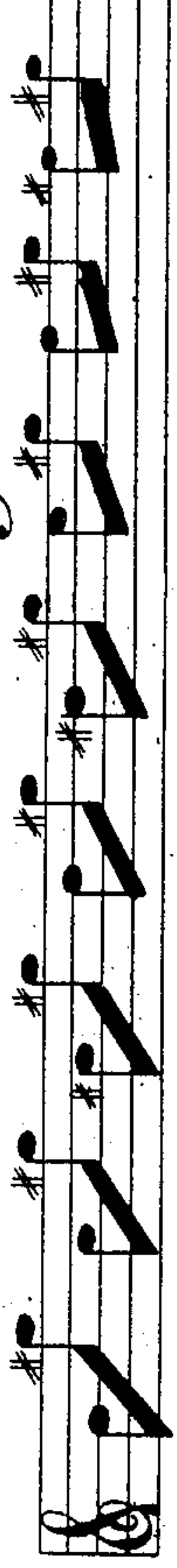
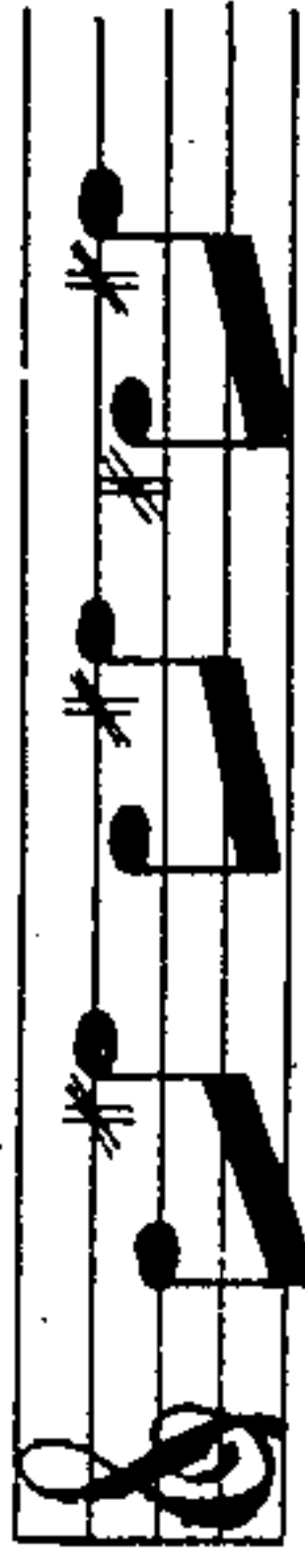


Fig. 9.

Fig. 10.



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UNITED STATES PATENT OFFICE.

LEWIS M. ELLIS, OF CONNERSVILLE, INDIANA.

WIND INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 745,804, dated December 1, 1903.

Application filed August 8, 1901. Serial No. 71,306. (No model.)

To all whom it may concern:

Be it known that I, LEWIS M. ELLIS, a citizen of the United States, residing at Connerville, in the county of Fayette and State of Indiana, have invented a new and useful Wind Instrument, of which the following is a specification.

My invention relates to an improvement in the key mechanism of wind instruments—such as clarinets, flutes, saxophones, oboes, bassoons, &c.

The object of my invention is to so construct the key mechanism as not to interfere with the present system of fingering, yet at the same time to make possible certain necessary and desirable combinations not heretofore ordinarily accomplishable.

The accompanying drawings illustrate my invention as applied to the clarinet.

Figure 1 shows an elevation of the lower half of the main stem of a clarinet, the bell being omitted. Fig. 2 is a plan of the upper end at a slight angle to the view shown in Fig. 1, the mouthpiece being omitted. Fig. 3 is an under plan of the keys of the upper end. Fig. 4 is a side elevation thereof. Fig. 5 is an inverted detail. Fig. 6 is a horizontal sectional detail of most of the keys shown in Fig. 1. Fig. 7 is a similar detail of most of the keys shown in Fig. 2. Fig. 8 is a sectional detail of the parts shown in Fig. 5. Figs. 9 and 10 illustrate musical passages which can be more conveniently produced by my apparatus than by construction heretofore made.

The body of the instrument is provided with the usual holes 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, and 23 and also with a hole (not shown) in transverse line with hole 9 and covered by a cover-key 10'. Between holes 15 and 17 I also provide the usual hole, (not shown,) covered by the usual hole-cover key 16'. Holes 1 2 3 4 5 and those covered by covers 10', 16, and 22' are normally closed by their respective covers. Holes 6, 8, 11, 13, and 15 are closed by the fingers, and when the said holes are closed holes 7, 9, 12, and 14 are also closed by their respective covers by the action of the fingers on the respective ring-keys surrounding the holes 6, 8, 11, 13, and 15. Holes 17, 18, 19, 20, 21, and 23 are normally open. Hole 1 is covered by hole-cover 1', the lever of which

is carried around beneath the instrument in the usual manner to a position to be operated by the thumb of the left hand. Hole 2 is covered by a hole-cover 2', which is carried by a shaft 2'', pivoted between standards 25 and 26, parallel to the body of the instrument. Shaft 2'' is provided at its lower end with a finger-piece 2''', which lies in position to be operated by the knuckle of the forefinger of the right hand. Mounted between standards 25 and 26 and extending beyond 26 to a standard 27 is a shaft 28. Rotatable upon shaft 28 is a sleeve 29, which carries a hole-cover 3' for the hole 3. Secured to the lower end of sleeve 29 is a bridge 30, which straddles a sleeve 31, revoluble upon shaft 28, immediately below sleeve 29 and beneath bridge 30. Bridge 30 is provided at its lower end with a portion 32, sleeved upon shaft 28 and to which is secured a finger 33, which lies somewhat beneath a finger 34, carried by a sleeve 35, rotatably mounted upon shaft 28 immediately below sleeve 31. Secured to sleeve 31 is a bar 36, which extends downward parallel with shaft 28 and is provided at its lower end with a finger-piece 3'', which lies immediately under finger 2'''. Secured to sleeve 35 is a ring-key 6', which lies adjacent hole 6 and is provided with a tail 6'', which passes beneath a hole-cover 7', arranged to close hole 7. Rotatably mounted upon shaft 28, immediately below sleeve 35, is a sleeve 37, to which is secured a bar 38, which passes downward parallel with the body of the instrument and is provided at its lower end with a finger-piece 39, which lies beneath and slightly below the finger-pieces 2'' and 3''. Bar 38 is supported at its lower end by a sleeve 40, rotatable upon shaft 28. Rotatably mounted upon shaft 28 immediately below sleeve 37, is a sleeve 41, which carries the hole-cover 7'. Below sleeve 41 is a sleeve 42, which carries a ring-key 8', arranged adjacent hole 8. Secured to sleeve 42 is a finger 43, which lies beneath a finger 44, carried by a hole-cover 9', arranged to close hole 9, the said hole-cover being carried by a sleeve 45, rotatably mounted upon shaft 28 below sleeve 42. Also secured to sleeve 45 is a ring-key 11', arranged adjacent hole 11.

Arranged upon the body of the instrument adjacent holes 12 and 13 is a pair of

standards 46, which support a shaft 47, upon which is sleeved a pair of sleeves 48 and 49. Secured to sleeve 48 is an arm 48 $\frac{1}{2}$, which lies immediately beneath and is engaged by a tail 50, carried by a finger-piece 51, pivoted upon the lower end of shaft 28. Secured to sleeve 49 is a hole-cover 12' and ring-key 13'. Supported in standards 52 is a shaft 53. Rotatable upon said shaft is a sleeve 54, carrying hole-cover 14', ring-key 15', and a lug 55. Mounted upon shaft 53, below sleeve 54, is a sleeve 56, which carries hole-cover 17'. Sleeve 56 also carries a lug 57, which passes beneath the lug 55, of any usual well-known form, by means of which connection between sleeves 55 and 56 may be accurately adjusted. Sleeve 56 also carries at its lower end an adjusting-lug 58. Below sleeve 56 upon shaft 53 is a sleeve 59, which carries hole-cover 20', a lug 60, which passes beneath lug 58, and a lug 61. Below sleeve 59 upon shaft 53 is a sleeve 62, which carries hole-cover 23', a lug 63, which lies beneath lug 61, and a tail 64, which is adapted to be engaged by a long key 65, the upper end of which is carried up in position to be engaged by the little finger of the left hand and is provided with a tail 66, which lies above and is adapted to engage arm 48 $\frac{1}{2}$. Hole 22 is covered by a hole-cover 22', which is operated by a long key 67, which is brought into position to be engaged by the little finger of the left hand in the usual manner. Key 67 is, however, provided with a tail 68, which lies immediately above and is adapted to engage arm 48 $\frac{1}{2}$. Parallel with shaft 53 is a shaft 69, which is supported in standards 70. Mounted upon shaft 69 is a key 71, which carries hole-cover 19'. The stem of hole-cover 17' passes beneath shaft 69, and the hole-cover is engaged by a finger-piece 72, which is carried by a sleeve 73, rotatable upon the upper end of the shaft 69. Secured to sleeve 73 is a bridge 74, which passes over the key 71 and at its lower end is secured to the hole-cover 18', which is sleeved upon shaft 69. Rotatable upon the lower end of shaft 69 is a sleeve 75, which carries hole-cover 21', a finger 76 brought adjacent key 71, and a lug 77, which lies above and is adapted to engage hole-cover 20'. The hole-covers 14', 17', 18', 20', 21', and 23' and ring-key 15' are held normally up by the usual arrangement of springs engaging the respective sleeves to which said hole-covers and ring-key are secured.

Referring now to Fig. 5, projecting from the under side of sleeve 48 is a lug 48', and projecting from sleeve 49 adjacent lug 48' is a lug 49'. Secured to one of standards 46 is a spring 49'', which engages both lugs 48' and 49'. Secured to sleeve 48 is one end of a spring 48'', the end of which engages both lugs 49' and 48' upon the side opposite to that engaged by the spring 49''. By this arrangement it will be noticed that upon depressing either one of finger-keys 51, 65, or 67 arm 48 $\frac{1}{2}$ of sleeve 48 will be engaged and said

sleeve swung upon its shaft. The strength and arrangement of spring 49'' is such as to normally hold down the hole-cover 12' and ring-key 13'; but when the sleeve 48 is swung, as described, spring 49'' is deflected by the lug 48' and spring 48'' operates to swing sleeve 49, so as to withdraw from their respective holes the hole-covers and ring-key. If this movement has been produced by key 65 and it is desired to retain the effect produced consequent upon the depression of hole-covers 14', 17', 20', and 23' and yet produce the effect consequent upon the closing of hole 13 with the finger and the consequent closing of hole 12 with the hole-cover 12', the result may be accomplished by pressing the first finger of the right hand on ring-key 13', sleeve 49 being thus swung upon its shaft, so as to depress hole-cover 12' and spring 48'', serving to return the parts to raised position immediately upon the release of the ring-key 13'. It is to be noticed in this connection that the result is accomplished not by a difference in strength of the two springs 48'' and 49'', but instead by reason of the fact that one of the springs is carried by one of the sleeves and that the springs overlap on opposite sides of the lugs. Herein lies what I conceive to be one of the fundamental features of my invention, and this mechanism is reproduced in several parts now to be described. It is not absolutely necessary that each spring engage both lugs; but such an arrangement is advisable, as a better balance and set of the parts may be maintained.

Projecting from sleeve 45 is a lug 45', which is engaged by the free end of a spring 78, which is secured to the lug 43, carried by sleeve 42. Said lug 43 is engaged by the free end of a spring 79, which is secured to an intermediate standard 80, through which the shaft 28 is passed. Sleeve 42 carries an adjusting-lug 81, which passes beneath a lug 82, carried by the sleeve 41. (See Fig. 3.) Projecting from the under side of sleeve 41 is a lug 83, adjacent to which is a lug 84, which projects from the under side of the sleeve 37. Sleeve 37 is also provided with a lug 85, to which is attached a spring 86, the free end of which engages lug 84 and lies in line with lug 83. The opposite sides of lugs 83 and 84 are engaged by the free end of a spring 87, which is secured to a lug 87', projecting from the under side of sleeve 35. Said lug 87' is engaged by the free end of a spring 88, which is secured to one of the intermediate standards 80. Projecting from about the middle of sleeve 31 is a lug 89, to which is secured a spring 90, the free end of said spring engaging lugs 91 and 92, which project from adjacent ends of sleeves 31 and 29, respectively. The opposite sides of said lugs 91 and 92 are engaged by the free end of a spring 93, which is secured to standard 25. Secured to standard 25 is a second spring 94, the free end of which engages a lug 95, carried by the shaft 2'' and so arranged as to normally hold hole-

cover 2' down over its hole. Sleeve 42 carries an arm 96, which is projected beneath shaft 2'', so that when said shaft is thrown downward it will engage said arm 96 to swing sleeve 42.

Spring 93 engages lugs 92 and 91 upon the proper side to normally hold hole-cover 3' over its hole 3 and to hold the finger-piece 3''' up. Spring 88 engages lug 87' upon the proper side to raise ring-key 6', which, by reason of its tail 6'', also operates to raise hole-cover 7'. Spring 87 engages lug 83 upon the proper side to hold hole-cover 7' in engagement with tail 6''. Spring 86 rests against lug 84 and projects into the path of lug 83; but sufficient space is left between the lug 83 and the spring to allow the depression of hole-cover 7' to closed position before lug 83 comes into contact with said spring. Spring 79 engages lug 43 on the side proper to normally raise ring-key 8', thus resulting through lugs 43 and 44 in the normally raised position of the hole-cover 9' and the ring-key 11'. Spring 78, which is secured to lug 43, engages lug 45' on the side proper to maintain lug 44 in engagement with lug 43. By this arrangement a depression of either of ring-keys 11' or 8' will result in a depression of hole-covers 7' and 9'. If ring-key 8' has been depressed and ring-key 11' is left free, however, hole-cover 9' may be raised by depressing key 39, the rod 36 thereof engaging tail 96, which projects from the side of sleeve 45. The hole-cover 9' may also be raised when it has been first depressed by a depression of ring-key 8' by a depression of either of finger-keys 2''' or 3''', the said keys lying in succession over the finger-key 39. The arrangement of springs is also such that a depression of ring-key 6' will cause a depression of hole-cover 7'; but said hole-cover may be then raised by a depression of finger-key 39 or either of the keys 2''' or 3''' immediately thereover.

The mechanism described as applied to a clarinet does not change in any way the present system of fingering of the two or four ring Buffet system clarinet, but gives many new and desirable fingerings for securing different tones, some of which have been very difficult with the present system and have required long and tiresome practice before they could be successfully accomplished. Other systems of fingering have been devised to overcome or make possible such difficult combinations; but such systems have required the player to learn new fingerings before he could use the instrument at all. In the present case my instrument is capable of producing the required tones in the usual and regular ways now common in clarinets or other similar instruments, but in addition makes possible new fingerings which may be added by the player from time to time as opportunity is afforded.

It will be noticed that as each tone-hole in the left hand is opened those immediately

below it are open, thus giving a perfectly free exit, and consequently full and pure tones free from that choked quality which has heretofore been common in instruments of this class. This opening of the tone-holes in the left hand also permits perfect tuning to each other and to the "fork-tones" in a manner not heretofore possible with the ordinary system.

By the arrangement of connections between the keys described many new fingerings are possible, chief among which are the following: A-natural can be made in the regular way with the A \sharp key 4', also by pressing 3''' with the thumb-hole (not shown) closed. B-flat can be made with A \sharp key 4' and thumb-key 1', with 3''' and the thumb-key 1', with 4' and 3''', with key 2'''. B can be made in the regular way with all fingers down and thumb-key 1' open or with keys A \sharp 4' and 2''', with 2''' and thumb-key 1', or with A \sharp key 4', 3''' and thumb-key 1'. C can be made in the regular way or with A \sharp key 4', 2''' and thumb-key 1'. C-sharp can be made in the two usual ways as in fifteen-key instrument. D-sharp can be made three ways—by opening key D \sharp 19', by holding first, second, and fourth fingers of right hand down and raising third of right, or by holding first and second of right hand down and fourth (key 65) of left hand. The advantage of this improvement in passages like the passage illustrated in Fig. 9 can be appreciated. F-natural of the second octave can be made in four ways—by opening key 16', by holding down first and third of right hand and raising second, by holding down first and fourth of right hand, and by holding down first of right hand and fourth of left. G-sharp of the second octave can be made in four ways—by pressing G \sharp key 51, B \sharp key 65, or C \sharp key 67, or by raising third finger of left hand and closing first and second of right. A-sharp of the second octave can be made in four ways—by opening key A \sharp key 10', by pressing key 39 or key 3''', and by closing first and third of left hand and raising second. C-natural of the second octave can be made in three ways—by pressing key 39 or key 3''' or by raising first of left hand and closing second. The advantage of the mechanism for producing G-sharp of the second octave can be appreciated in passages like that shown in Fig. 10.

The chromatic scale may be produced on applicant's instrument both by opening the holes successively and also by cross-fingering.

I claim as my invention—

1. In a wind instrument, the combination of a pair of rotatable sleeves, a lug projecting from each sleeve, a spring carried by one sleeve and engaging the lug of the other sleeve, and a second spring acting in the opposite direction to the first spring and engaging the lug of the first-mentioned sleeve.

2. In a wind instrument, the combination of a sleeve, one or more keys adapted to rotate the said sleeve, a combined ring-key and

hole-cover, a spring connection between said sleeve and the combined ring-key and hole-cover, and means engaging both the sleeve and the combined ring-key and hole-cover for yieldingly holding the two parts in normal positions.

3. In a wind instrument, the combination of a pair of movable sleeves, a spring carried by a stationary support and engaging both of said sleeves in one direction, and a second spring carried by one of said sleeves and engaging the other sleeve in a direction opposite to the direction of the first spring.

4. In a wind instrument, the combination of a pair of movable sleeves, a spring carried by one of said sleeves and engaging the other, and a second spring carried by a stationary support and engaging the sleeve engaged by the first spring but in opposition to said first spring.

5. In a wind instrument, the combination of an operating-sleeve, a combined ring-key and hole-cover, a spring carried by said sleeve and engaging the combined ring-key and hole-cover, and a spring carried by a stationary support and engaging the combined ring-key and hole-cover in opposition to the first spring.

6. In a wind instrument, the combination of a combined ring-key and hole-cover, a second ring-key, means for yieldingly holding the combined ring-key and hole-cover in engagement with the second ring-key, and means for independently operating the combined ring-key and hole-cover in opposition to said yielding means.

7. In a wind instrument, the combination of a combined ring-key and hole-cover, a second ring-key, interacting parts, engaging in one direction only, carried by the said two parts, a spring carried by the second ring-key and engaging the combined ring-key and hole-cover to hold said interacting parts together, and means for independently moving the combined ring-key and hole-cover in the opposite direction.

8. In a wind instrument, the combination of a combined ring-key and hole-cover, a second ring-key, a pair of interacting lugs carried by said two parts and operable in one direction only, a spring carried by the ring-key and engaging the combined ring-key and hole-cover so as to hold the said lugs together, and a spring carried by a stationary support and engaging the ring-key.

9. In a wind instrument, the combination of a ring-key, a hole-cover, intermediate connections acting in one direction only between said ring-key and hole-cover, a second ring-key, intermediate connections acting in one direction only between said second ring-key and the hole-cover, means for normally holding together the said intermediate connections between the first ring-key and the hole-cover, and between the second ring-key and the hole-cover, and means for independently operating the hole-cover.

10. In a wind instrument the combination

of a normally raised ring-key, a normally raised hole-cover, a pair of lugs carried one by each of said parts and acting in a direction to close the hole-cover upon a depression of the ring-key, a second normally raised ring-key, intermediate connections between said second ring-key and the hole-cover to normally raise the hole-cover, yielding means holding the hole-cover in engagement with both ring-keys, whereby the hole-cover will be closed upon a depression of either ring-key, and means independent of the ring-keys for raising the hole-cover.

11. In a wind instrument, a ring-key, a spring normally raising said ring-key, a second ring-key, a spring normally raising said second ring-key, a hole-cover mounted between the two ring-keys, intermediate separable connections between the second ring-key and the hole-cover for normally raising the hole-cover, intermediate separable connections between the first ring-key and the hole-cover whereby a depression of said first ring-key will depress the hole-cover, and a spring carried by the second ring-key and engaging the hole-cover and yieldingly holding the hole-cover in engagement with said second ring-key.

12. In a wind instrument, a combined ring-key and hole-cover a second ring-key, a second hole-cover, intermediate separable connections between the combined ring-key and hole-cover and the second ring-key, means for yieldingly holding said connections together whereby a depression of either ring-key will cause a depression of the second hole-cover, means for raising the combined ring-key and hole-cover independent of the second ring-key and second hole-cover, intermediate separable connections between the second ring-key and the second hole-cover whereby a depression of said second ring-key will depress the second hole-cover, a third ring-key, intermediate separable connections between said third ring-key and the second hole-cover, means for yieldingly holding said connections together whereby a depression of the said third ring-key will cause a depression of said second hole-cover, and means independent of the said third ring-key for raising said hole-cover.

13. In a wind instrument, the combination of a normally raised combined ring-key and hole-cover, a normally raised second ring-key, a pair of coacting lugs carried one by each of said parts, a spring carried by the second ring-key and engaging the combined ring-key and hole-cover to hold said lugs in normal engagement, a second hole-cover, intermediate connections acting in one direction only between the second ring-key and the second hole-cover, a third normally raised ring-key, intermediate connections acting in one direction only between said third ring-key and the second hole-cover for normally raising the second hole-cover, a third hole-cover, means for normally holding said third hole-cover

closed, a finger-key for raising said third hole-cover, a pair of normally separated lugs one carried by the third ring-key and the other by the third hole-cover, and a spring connection between said last-mentioned finger-key and the third hole-cover, whereby the third hole-cover may be depressed by a depression of the third ring-key when the said finger-key is held depressed.

10 14. In a wind instrument, the combination of a normally raised ring-key, a normally closed hole-cover, an independently-movable finger-key, intermediate normally separated connections operable in one direction only
15 between said ring-key and hole-cover, a spring carried by the finger-key and engaging the hole-cover, and a spring carried by a stationary support and engaging the hole-cover and finger-key in a direction opposite to the first-
20 mentioned spring.

15 15. In a wind instrument, the combination of a normally raised combined ring-key and hole-cover, a normally raised second ring-key, a pair of lugs carried by said parts, a spring
25 carried by the second ring-key and engaging the combined ring-key and hole-cover to hold the said lugs in normal engagement, a spring carried by a stationary support and engaging the said second ring-key so as to normally
30 raise the same, a second hole-cover, a pair of cooperating lugs carried one by the second ring-key and one by the second hole-cover in position to cause a depression of the second hole-cover upon a depression of the second
35 ring-key, a finger-key, a tail carried by the combined ring-key and hole-cover adapted to be engaged by said finger-key, a spring carried by said finger-key and arranged to be

brought into engagement with the second hole-cover, a third ring-key, a spring carried 40 by said ring-key and arranged to engage the second hole-cover in opposition to the finger-key spring, a portion of the third ring-key projected beneath the second hole-cover, a third hole-cover, a spring carried by a sta- 45 tionary support and engaging said third hole-cover to normally close the same, a second finger-key also engaged by said last-mentioned spring, a spring carried by said second finger-key and engaging the said third hole- 50 cover in opposition to the before-mentioned spring, and a pair of normally separated lugs carried one by the third hole-cover and the other by the third ring-key whereby, after an elevation of the third hole-cover by means of 55 the second finger-key, the said third hole-cover may be depressed by a depression of the third ring-key.

16. In a wind instrument, the combination of a hole-cover, an independently-movable 60 finger-key, an independently-movable ring-key, said ring-key engaging the hole-cover in one direction only, a spring carried by a stationary support and engaging the ring-key, a lug carried by the finger-key, an adjacent 65 lug carried by the hole-cover, a spring carried by the ring-key and engaging the lug of the hole-cover, and an oppositely-operating spring carried by the finger-key and having its free end projected into the path of move- 70 ment of the lug of the hole-cover.

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