

1,211,983.

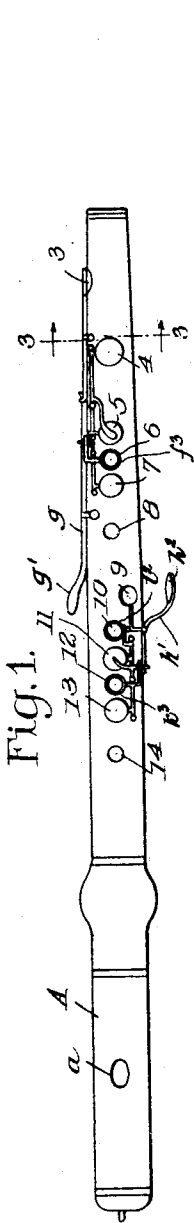


Fig. 1.

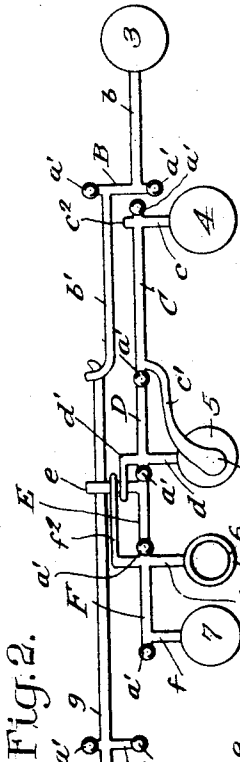


Fig. 2.

Fig. 3.

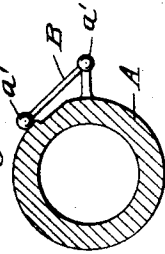
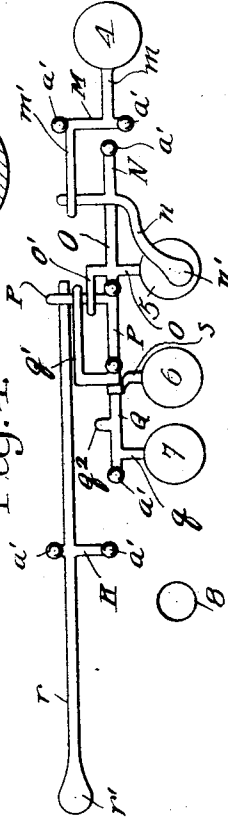


Fig. 4.



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# UNITED STATES PATENT OFFICE.

GEORGE STERNBERG, OF AGAÑA, ISLAND OF GUAM.

WOOD WIND MUSICAL INSTRUMENT.

1,211,983.

Specification of Letters Patent.

Patented Jan. 9, 1917.

Application filed April 16, 1914. Serial No. 832,208.

*To all whom it may concern:*

Be it known that I, GEORGE STERNBERG, a citizen of the United States, and a resident of Agaña, Guam, Marianne Islands, United States of America, have invented a new and useful Improvement in Wood Wind Musical Instruments, of which the following is a specification.

My invention is an improvement in wood wind musical instruments, and the invention has for its object to provide a keyboard for use in such instruments, as for instance flutes, clarinets and the like, so constructed and arranged as to permit the player to make all the notes without shifting his fingers or changing the position thereof, and without the necessity for cross fingering.

In the drawings: Figure 1 is a plan view of a *c* sharp foot note flute, constructed in accordance with the invention; Fig. 2 is a development of the key board of the flute on a flattened surface; Fig. 3 is a transverse section on the line 3—3 of Fig. 1, looking in the direction of the arrow adjacent to the line; and Fig. 4 is a diagrammatic view of the lower keyboard of a *d* foot note flute, in which the fingering or method of forming the notes is the same as in Fig. 2.

The flute shown in Fig. 1 consists of a tube A having a mouth hole *a* and thirteen sound holes, the said sound holes being indicated by the numerals 3 to 15 inclusive. Each of the sound holes, 3, 4, 5, 7, 9, 11 and 13 is covered by a padded cover, and the designating numeral for the sound hole is arranged on or near the cover. All of the covers above mentioned are normally held open or lifted from off the holes which they are intended to cover, by springs of ordinary type, which it is not necessary to show, the said springs being beneath the sleeves to be later described, to which the covers are connected.

Each of the sound holes 6, 10 and 12 is encircled by a ring of ordinary type, and the said rings do not cover or close the holes, simply encircling them and serving as finger pieces to close adjacent covers. The sound holes designated 8, 14 and 15 are simply openings in the material of the tube. Each cover and each ring is mounted on a sleeve and each sleeve is mounted on a rod, which is supported by posts secured to the body of the instrument. The posts are threaded into

or cemented to the material of the tube, and each post has an opening, and rods are mounted in the openings. One end of each rod has a transverse kerf or groove for engagement by a screw driver or the like instrument, and the other end of each rod is threaded into a post. By turning the rod in the proper direction, any rod may be released from the posts while when in position they are rigidly held by the posts and the sleeves are mounted on the rods. This construction above mentioned is old and well known, being the usual arrangement of cover mounting in instruments of the character in question, and for this reason it is not thought necessary to show the same.

Ten of the sleeves above mentioned are provided in the present construction, each sleeve having arms and stems to be later described, the arms being used as finger pieces for operating the sleeves, while the stems are connected to the rings and covers. Each rod serves as a pivot upon which the adjacent sleeve may oscillate, to bring the cover into position over the adjacent opening or away from over the said openings. Commencing at the end remote from the mouth hole, a sleeve B is supported between posts *a'*, and this sleeve has a stem *b* extending radially from the sleeve and supporting at its outer end the cover 3. An arm *b'* extends radially from the sleeve in the opposite direction to the stem *b*, and this arm overlies at its free end the adjacent end of a lever *g* to be later described, for oscillating the sleeve B, to close the cover connected therewith when desired. A second sleeve C is arranged at right angles to the sleeve B, being supported between posts *a'*, and the sleeve C has a stem *c* and an arm *c'*, the stem *c* extending from the sleeve at the end adjacent to the sleeve B, while the arm *c'* extends from the sleeve near the opposite end. This arm *c'* extends radially from the sleeve C for a short distance, and then longitudinally of the sleeve and again radially, and the extremity of the arm is enlarged laterally to form a finger piece or key *c*<sup>2</sup>. Three other sleeves, D, E and F are arranged in alignment with the sleeve C, the sleeves being in the order mentioned from the sleeve C toward the mouth opening *a*, and the said sleeves are supported by posts *a'*. The said sleeves C, D, E and F may be supported on

a common rod, which is held in the four posts, and the sleeves are separated from each other by the posts.

The cover 5 is connected to the sleeve D by a stem  $d$ , and the said sleeve D has an arm  $d'$  extending in the opposite direction to the stem D, and the said arm  $d'$  is angular, comprising a portion radial to the sleeve D and a portion parallel with the said sleeve. The sleeve E has an arm  $e$  extending radially from the sleeve in the same direction as the arm  $d'$ , and this arm  $e$  overlies one end of the lever  $g$  before mentioned. The sleeve F has a stem  $f$  which is connected to the cover 7, and the said sleeve is also provided with an arm  $f'$  extending toward the sound hole 6 and the arm is provided at its outer end with a ring  $f^2$ , encircling the sound hole 6. The sleeve is also provided with an arm  $f^2$  of angular form, and extending in the opposite direction to the arm  $f$ . This arm  $f^2$  has a portion radial to the sleeve and a portion parallel with the sleeve and extending in the opposite direction, and this last named portion overlies the arm  $e$  of the sleeve E. Thus the arms  $d'$  and  $f^2$  both overlie the arm  $e$  of the sleeve E and the arm  $e$  overlies the lever  $g$  at one end thereof. This lever  $g$  has intermediate the ends thereof a sleeve G, which is supported by posts  $a'$ , and the arms  $e$  and  $b'$  overlies the lever at the same side of the pivotal connection, and near the end of the lever the arm  $b'$ , being in fact at the end of the lever. The opposite end of the lever has a finger piece or key  $g'$ , and this lever is normally held in such position that the covers 3, 5 and 7 will be open. By means of the key or finger piece  $g'$  of the lever  $g$  the covers 3, 5 and 7 may be simultaneously closed, and it will be evident that when the finger piece  $g'$  of the lever  $g$  is depressed or moved toward the body of the flute, the opposite end will be lifted, and the sleeves B, D and F will be oscillated in a direction to simultaneously move the covers 3, 5 and 7 into closed position.

The sound holes 4, 5, 6, 7, 8, 10, 11, 12, 13 and 14 are in alinement on the upper side of the body, and the sleeves B, and G are at right angles to the long axis of the body, the sleeves C, D, E and F being parallel with the said long axis.

A sleeve H is arranged adjacent to the sound hole 10, and transverse to the long axis of the body, the said sleeve being supported between posts  $a'$  in the usual manner. The sleeve has a stem  $h$  which supports the cover 9, and the sleeve has also secured thereto and transversely thereof a lever  $h'$  at the opposite end from the stem  $h$ , and the outer end of the lever is widened or flattened to form a finger piece  $h^2$ . By means of this finger piece  $h^2$  the sleeve may be oscillated to close the cover 9.

The sleeve I has a stem  $i$  which supports

the cover 11, and this sleeve has an arm  $i'$  which extends toward the sound hole 10, and supports a ring  $i^2$  which encircles the sound hole 10. The sleeves I, J and K are journaled on a common rod (not shown) which is supported by three posts  $a'$ . The sleeves I and J abut at their adjacent ends, there being no post between them, but the sleeves J and K are separated by a post. The sleeve J has arms  $j$  and  $j'$  extending in opposite directions from the end of the sleeve adjacent to the sleeve I, and the arm  $j$  overlies the cover 11. The adjacent end of the lever  $h'$  underlies the arm  $j'$  of the sleeve J, so that when the finger piece  $h^2$  of the lever  $h'$  is depressed or moved toward the body of the flute, the covers 9 and 11 will be simultaneously closed. The sleeve K has a stem  $k$  which supports the cover 13 at its outer end, and this sleeve has also an arm  $k'$  and an arm  $k^2$ , the said arms being at the end adjacent to the sleeve J, and the arms extend in opposite directions. The arm  $k'$  is similar to the arm  $f'$  of the sleeve F, and carries at its outer end a ring  $k^3$  which encircles the sound hole 12, so that that finger which covers the sound hole may simultaneously operate the sleeve K. By means of the finger piece  $h^2$ , the covers 9, 11 and 13 may be simultaneously closed. The arm  $j$  of the sleeve J before mentioned overlies the cover 11, depressing the said cover when the sleeve is oscillated in the proper direction, and the arm  $j'$  of the said sleeve overlies the adjacent end of the lever  $h^3$  of the sleeve H. The angular arm  $k^2$  of the sleeve K overlies the arm  $j'$ , and when the sleeve H is oscillated in a direction to close the cover 9 by the finger piece  $h^2$  the sleeves  $j$  and  $k$  will be oscillated to close the covers 11 and 13. When the sleeve K is oscillated by the finger in engagement with the ring  $k^3$ , the oscillation of the said sleeve does not affect the sleeve J, because of the fact that the angular arm  $k^2$  is above the arm  $j'$ . When the ring at the sound hole 12 is depressed, only the sleeve K is affected.

The sound hole 15 is on the under side of the flute body, and the fingers of the player have a fixed or permanent position with respect to the sound holes and their covers. The thumb of the left hand is used to close the hole 15, while the first finger of the said hand is used to close the hole 14. The second finger of the left hand is used to close the hole 12 and to operate, by means of the ring  $k^3$ , the cover 13. The third finger of the left hand is at the hole 10, and this finger may simultaneously close the hole 10 and the cover 11, by means of the ring  $i^2$ . The fourth finger of the left hand is used to manipulate the lever  $g$ , to simultaneously depress the covers 3, 5 and 7. When the finger piece  $g'$  of this lever  $g$  is depressed, the sleeves D, E, and F will be oscillated in a direction to close the

covers 3, 5 and 7. The palm of the right hand, or rather the inner side of the palm, is made use of to operate the lever  $h'$ , and by means of this lever the covers 9, 11 and 13 may be simultaneously closed. When the finger piece  $h^2$  is depressed, the sleeves J and K are simultaneously oscillated in a direction to simultaneously close the covers 11 and 13 connected with the sleeves I and K. The first finger of the right hand is at the sound hole 8, the second finger at the sound hole 6, and the third finger is used to operate the finger piece  $e^2$ . The second finger of the right hand at the sound hole 6 may simultaneously close the sound holes 6 and 7, the former directly and the latter indirectly, through the ring  $f^3$  which encircles the sound hole 6. The third finger may simultaneously close the sound holes 4 and 5, the latter directly and the former indirectly, through the oscillation of the sleeve C. The fourth finger of the right hand is not required, and hence not used.

In Fig. 4 is shown the lower portion of a  $d$  foot note flute, the sound holes being numbered 4, 5, 6, 7 and 8, respectively. It will be understood that only the lower portion of the key board is shown in this figure, and the sound holes 4, 5, 6 and 7 are provided with covers, the numerals designating the sound holes being on the covers. A sleeve M is supported between the posts  $a'$  and a stem  $m$  extending radially from the sleeve supports the cover 4 at its outer end. An arm  $m'$  extends from the sleeve in the opposite direction to the stem  $m$  and at the opposite end of the sleeve, and this arm overlies one end of a lever  $n$  which is secured transversely of a sleeve N. This sleeve is mounted together with three other sleeves, O, P and Q on a single rod, which is supported by four posts  $a'$ . The sleeves N and O abut at their ends, but the remaining sleeves are separated by posts. The lever  $n$  is provided with a finger piece  $n'$ , which overlies the cover 5, and the opposite end of the lever engages beneath the arm  $m'$  of the sleeve M. Thus by means of the lever  $n$  the covers 4 and 5 may be simultaneously closed. The sleeve O is connected to the cover 5 by a stem  $o$  and the said sleeve has an angular arm  $o'$  extending in the opposite direction to the stem  $o$ . This arm consists of a portion radial to the sleeve and of a portion parallel with the sleeve and extending in the opposite direction, and the last named portion overlies an arm  $p$  extending radially from the adjacent end of the sleeve P. The sleeve Q is provided near one end with a stem  $q$ , and the stem supports the cover 7 at its outer end. The sleeve is also provided with an angular arm  $q'$  at the end remote from the stem  $q$ , but extending in the opposite direction, and this arm overlies the arm  $p$  before mentioned of the

sleeve P. The arm  $q'$  consists of a portion radial to the sleeve and a portion parallel therewith, and it is the parallel portion that overlies the arm  $p$ . A sleeve R is journaled between posts  $a'$ , and this sleeve has a lever  $r$  secured transversely thereof intermediate the ends of the lever. One end of the lever is flattened or enlarged laterally to form a finger piece  $r'$ , and the other end of the lever engages beneath the arm  $p$ . By means of this lever  $r$  the covers 5 and 7 may be simultaneously closed.

In the construction just described, the finger of the left hand engages the finger piece  $r'$ , the first finger of the right hand engages the sound hole 8, the second finger engages either the cover 6 or 7, and the third finger the cover 5 and the finger piece  $n'$ . The cover 6 is mounted loosely, on the sleeve Q or in any other suitable manner to permit the cover to move without affecting the sleeve. In this construction the lever  $r$  operates only the covers 5 and 7, and does not operate the cover 6. This is because the construction is a  $d$  foot note flute, and the lower  $c$  sharp cover 3 of Fig. 2 is absent, the fingering being the same, otherwise. The position of the second finger of the right hand in the Fig. 4 construction is intermediate the covers 6 and 7, so that the said finger may close both covers simultaneously, and may close either cover at will. The sound holes 14 and 15 are duplicates in size and they are similarly arranged with respect to the mouth hole. Because of this, either hole can be used for the same purpose or for making the same note. In practice, the cover 6 is connected to a separate sleeve which may be above or below the sleeve E. Preferably, the posts which support the sleeve E are of double height, and these posts support the sleeve E and the sleeve which carries the cover 6. The cover 6 is connected to the sleeve (not shown) by a stem  $s$ . This method of mounting the rods or sleeves one above the other is the usual manner, and for this reason is not shown. It will be noted that the sleeve C has a lug or arm  $c^2$  extending in the opposite direction to the cover 4, and the sleeve Q is provided with a similar lug  $q^2$  similarly arranged. The use of these lugs or arms  $c^2$  and  $q^2$  is to limit the rising movement of the covers.

The improved keyboard differs from existing systems in seven features hereinafter mentioned, the fingers having a permanent position, so far as shifting from sound hole to sound hole is concerned, and it is not necessary to change the finger position as above specified, in order to make the following trills or notes. The trill from the note  $b$  flat to  $c$  may be made with the second finger of the left hand, as may also the trill from  $a$  to  $b$  natural; second, the trill from  $g$  sharp or  $a$  flat to  $b$  flat may be made with

the third finger of the left hand, as may also the trill from *g* to *a*. Third, the trill from *d* sharp or *e* flat to *f* may be made with the second finger of the right hand, as may also the trill from *e* to *f* sharp. Fourth, the trill from low *c* sharp to *d* sharp or *e* flat may be made with the third finger of the right hand, as may also the trill from *d* to *e*. Fifth, the three trills from *g* to *a* flat, from *a* to *b* flat, and from *b* natural, to *c* may all be made with the palm or side of the right hand on the finger piece *h*<sup>2</sup> of the lever *h'*. Sixth, the three trills from low *c* sharp to *d*, from *d* sharp to *e*, and from *f* to *f* sharp may all be made with the fourth finger of the left hand by means of the finger piece *g'* on the lever *g*. Seventh, the thumb hole 15 is not found on the ordinary keyboard, and this hole is used principally to avoid cross fingering. For instance, when making the trill from *b* flat to *c*, the thumb and first finger of the left hand remain closed on the holes 14 and 15, in order to make the note *c*, while the second finger opens and closes the sound hole 12 and cover 13, repeatedly to form the trill. The second finger when making the trill from *a* to *b* natural opens and closes the sound hole 12 repeatedly, while the sound holes 14 and 15 are held closed as above mentioned, and while the covers 13, 11 and 9 are also held closed by means of the finger piece *h*<sup>2</sup> of the lever *h'*. When making the trill from *b* flat to *c* the second finger opens and closes the holes 12 and 13, while for the trill *a* to *b* natural the second finger opens and closes the hole 12 only.

It will be evident that the covers 5, 7, 11 and 13 receive action from two sources. For instance, the covers 5 and 7 may be simultaneously closed by the second and third fingers of the right hand, or by the fourth finger of the left hand. The covers 11 and 13 may be closed by the second and third fingers of the left hand, and also by the palm or side of the right hand.

The above described fingering for making the note *c* sharp, is an instance where the sound hole 15 can be used instead of the sound hole 14, and there are several other notes in the lower middle and alt register, where the same alternative method of forming the notes obtains. *c* is made by closing the sound holes 15 and 14, and the hole 13 is the open sound hole which regulates the pitch of the note. *b* natural is made by closing the sound holes 15, 14, 13, 11 and 9, and the note *b* flat is made by closing the holes 14, 15, 13 and 12. In the former instance, the hole 13 is an open hole near the mouth hole, while in the latter it is the hole 11. The note *a* is made by closing the holes 15, 14, 13, 12, 11 and 9, while *a* flat or *g* sharp is made by closing the holes 15, 14, 13, 12, 11 and 10. In *a* the hole 10 is the highest open hole, while in *a* flat the hole 9 is the

open hole which gives the note. The note *g* is made by closing all the sound holes from 9 to 15, and *f* sharp is made by closing all the holes from 8 to 15. With *g* the hole 8 is the open hole, while with *f* sharp the hole 7 is the open hole. The note *f* is made by closing the sound holes 15, 14, 13, 12, 11, 10, 9, 8, 7, 5 and 3, and in this instance the holes 4 and 6 are the only open sound holes. The hole 6 gives the note *f*. *e* is made by closing the sound holes from 6 to 15, leaving holes 3, 4 and 5 open, and the sound hole 5 gives the note. *d* sharp or *e* flat is made by closing all of the sound holes with the exception of *e*, and the hole 4 gives the note. *d* is made by closing all the sound holes from 4 to 15, and the open hole 3 gives the note. Low *c* sharp is made by closing all the sound holes and the opening or hole which gives the note in this instance is the open end of the instrument.

In Fig. 3 there is shown the manner of mounting the sleeve B in such manner that it will properly support the cover 3. It will be noted that one of the posts *a'* is of greater length than the other.

I claim as new—

1. A wood wind musical instrument of the flute class, comprising a tube having a lateral mouth open near one end, and a series of key-controlled openings extending longitudinally thereof, a plurality of series of sleeves journaled adjacent to the last named openings, the sleeves of one series being at the end adjacent to the mouth opening and the sleeves of the other series being at the opposite end of the tube and at the opposite side of the openings, the sleeves of each series having stems supporting rings adapted to encircle adjacent openings, and padded covers adapted to close the adjacent openings, and said sleeves having extensions extending in the opposite direction from the stems, a lever pivoted intermediate its ends to the tube at each series of sleeves and engaging between the adjacent extensions at one end and adapted for engagement by the hand of the player to simultaneously close the covers of the sleeves having the extensions, sundry of the sleeves having finger pieces overlying the adjacent covers whereby the finger pieces of the overlying covers may be simultaneously operated.

2. A wood wind musical instrument of the flute type, comprising a tube having a lateral mouth open near one end, and a series of key-controlled openings extending longitudinally thereof, a plurality of series of sleeves journaled adjacent to the last named openings, the sleeves of one series being at the end adjacent to the mouth opening and the sleeves of the other series being at the opposite end of the tube and at the opposite side of the openings, the sleeves of each series having stems supporting rings adapted

to encircle adjacent openings, and padded covers adapted to close the adjacent openings, and said sleeves having extensions extending in the opposite direction from the stems, a lever pivoted intermediate its ends to the tube at each series of sleeves and engaging beneath the adjacent extensions at one end and adapted for engagement by the

hand of the player to simultaneously close the covers of the sleeves having the extensions. 10

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."