

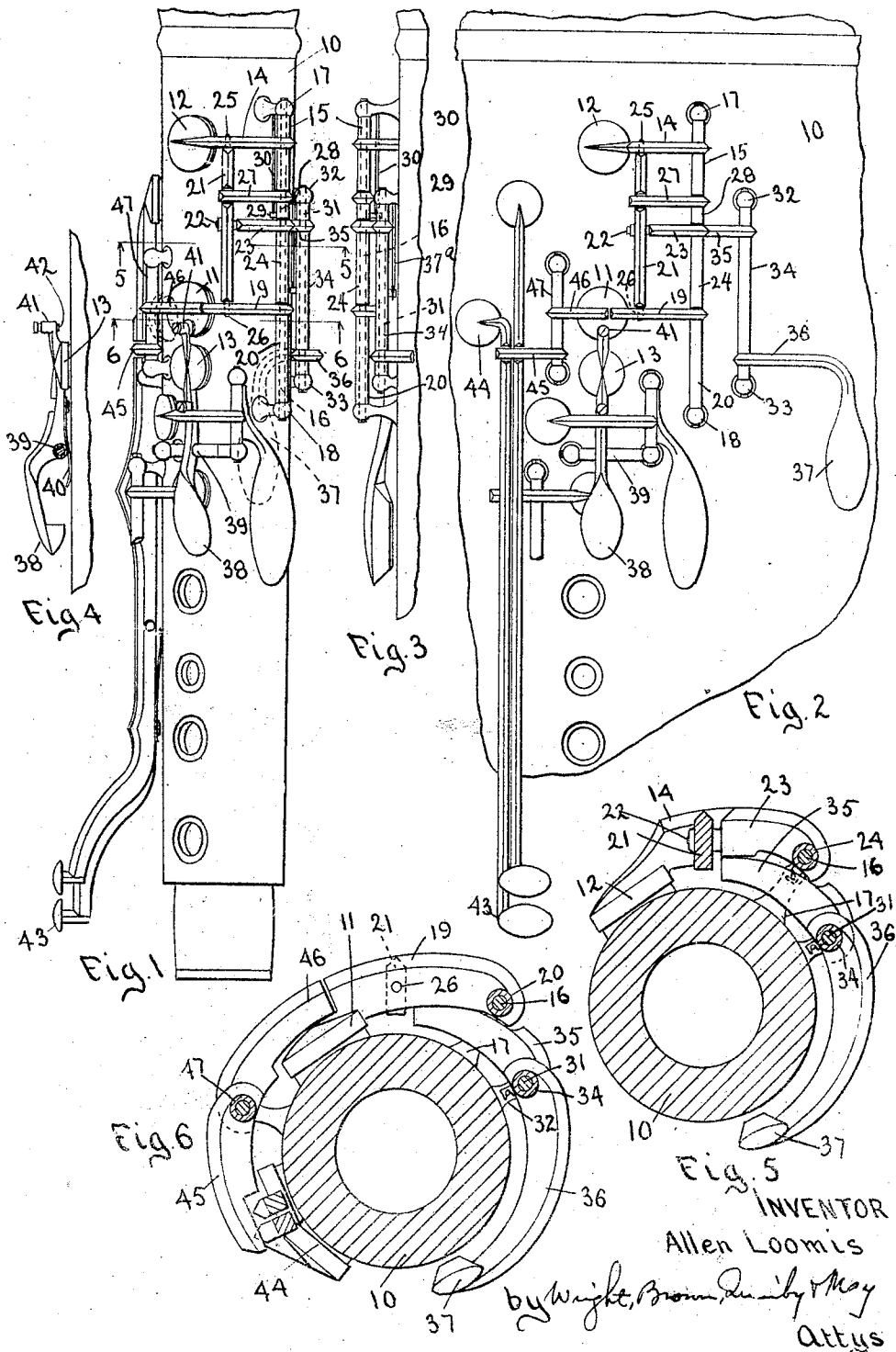
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KEY MECHANISM FOR CLARINETS AND THE LIKE

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# UNITED STATES PATENT OFFICE.

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KEY MECHANISM FOR CLARINETS AND THE LIKE.

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The present invention relates to a key mechanism for wood wind instruments of the clarinet family, the characteristic of which, as concerns the present invention, is that when overblown to produce tones in the upper register, the tone produced by overblowing is the next odd numbered harmonic above the fundamental tone of the lower register, and not the octave above such fundamental tone, as is the case with some other wood wind instruments.

Certain other instruments of the woodwind class are like those of the clarinet family in that the tones produced in the upper register are other intervals than the first octave above the tones of the lower register emitted from the same tone holes. The principles of the invention which I am now about to describe are applicable to flutes, oboes and bassoons as well as to clarinets, wherefore I have entitled the invention as an improvement in key mechanism for clarinets and the like, intending by that title to include the above named instruments, all of which are instruments of the clarinet family, and also all others of the woodwind class which are like the clarinet in the characteristic mentioned in the preceding paragraph. These instruments are provided with a hole called, or serving as, the register hole, which is opened and closed by a key called, or serving as, a register key, for controlling the emission of tones in the different registers; the register hole being closed when playing notes in the lower register and being open when playing a note in the upper register.

The particular embodiment of the invention which I have illustrated and described herein, has been designed for the clarinet, and will now be explained with reference to its application and use in that particular type of instrument; it being understood that this illustration and explanation are not intended to restrict the scope of protection which I claim.

Owing to the fact that the range between the fundamental note and the next odd numbered harmonic is eighteen semitones, in the instruments of this family, the players of these instruments are more seriously hand-

icapped by the limitation in the number of their digits than are the players of instruments which overblow in octaves. Heretofore, in order to reduce the difficulty of playing the clarinet, the register key has been made to serve also for playing the note B-flat on the middle line of the treble clef; but the resonance of this note is inferior to that of any other note of the clarinet, even though the adjacent A-natural hole be opened at the same time. The application of my present invention to the clarinet is designed to improve the tone quality of this note and to control the register key in conjunction with the control of the A-natural key. I have accomplished this result by providing a new hole for this B-flat, retaining the old hole of the instrument for use as a register hole, and combining with the A-natural key a floating lever mechanism of the character disclosed and claimed in my prior Patent No. 1,505,483, dated Aug. 19, 1924. In one view of the invention, the key mechanism which I have devised and applied to my present purpose is a special form of the mechanism claimed in said application, embodying the same fundamental invention, but with modifications adapting it to a special use.

Referring to the drawings:

Figure 1 is an elevation of a part of the upper end of a clarinet having the present invention applied thereto in a manner to serve the special purposes above set forth. In this and other views I have omitted for the sake of clearness, those keys and mechanisms which control other holes of the instrument and which have nothing to do with the particular invention here set forth;

Fig. 2 is a diagram of the complete mechanism showing the elements thereof resolved into a plane;

Fig. 3 is a detail elevation of the central pivot rod with the parts thereon;

Fig. 4 is a side elevation of the A-natural key;

Figs. 5 and 6 are cross sections on the lines 5-5 and 6-6 respectively of Fig. 1

Like reference characters designate the same parts wherever they occur in all the figures.

The body of the instrument is designated by the numeral 10. 11 represents the stopper covering the new B-flat tone hole of the instrument, 12 is a stopper covering the register hole, and 13 is the stopper covering the A-natural hole. In thus designating the tone holes by particular notes, namely A-natural and B-flat in the middle of the treble clef, I am describing a particular instrument to which I have applied this invention, and have not intended to exclude the application of the invention to other instruments in which the particular notes controlled by the mechanism may be different. The stopper 12 is carried by an arm 14 secured to a hub or sleeve 15 which turns freely on a pivot rod 16 (shown dotted in Figs. 1 and 3), supported by posts 17 and 18 on the instrument body. The stopper 11 is carried by an arm 19 secured to a sleeve 20 which also turns freely on the same pivot rod. This rod for the purpose of the present description I may define as the central pivot rod.

A lever 21, which I call a floating lever, is pivoted at 22 to an arm 23 secured to a sleeve 24 also turning freely on the central pivot rod. This floating lever is articulated at 25 to the arm 14 and at 26 to the arm 19, connection being made conveniently by ball-like extensions on the lever entering complementary sockets in the arms, or other free sort of connection which will permit the lever and either arm to swing about axes respectively at right angles to each other, and at the same time enable the lever to apply force positively in either direction of motion of the arms. It will be noted that the arms 14 and 19 turn about the pivot rod 16, while the lever 21 turns about the pivot 22 on rod 23, the axis of which is at right angles to the pivot rod 16. The floating lever also has freedom for a certain amount of movement endwise on the pivot 22, sufficient to permit either of its ends to be raised or lowered while the other remains at a constant height.

A fourth arm 27 is secured to a sleeve 28 which also turns freely on the pivot rod 16 and carries a stud or hook 29 with which is engaged a spring 30 secured in the post 17. The arm 27 overlies the floating lever 21 between the pivot 22 and the connection with the arm 14, and the spring 30 bears on the hook 29 at the side thereof which faces the floating lever, whereby the arm 27 is spring-pressed toward the instrument body and tends to hold both stoppers 12 and 11 closed upon their holes.

Another pivot rod 31 is mounted on the instrument between posts 32 and 33, and on this rod is rotatably mounted a sleeve 34 carrying a wiper arm 35 which underlies the arm 23. A key arm 36 is also secured to sleeve 34 and extends partly around the instrument, carrying at its end a key 37 adapt-

ed to be pressed upon by the thumb of the player's left hand. A light spring 37<sup>a</sup>, is mounted in post 32 and bears on a hook 37<sup>b</sup>, projecting from sleeve 34, to keep the wiper arm 35 in contact with the carrier arm 23. Although acting against spring 30 it is not powerful enough to impair the efficiency of the latter spring.

The stopper 13 is carried by a key lever, having a finger piece 38, pivoted at 39 and equipped with a spring 40, of a character common in clarinets, which presses on the instrument body at the side of the pivot away from the stopper and so tends to hold the stopper closed. The same key is provided with an extension 41 overlying the stopper 11 and carrying an adjustable abutment screw 42 arranged to bear on this stopper. Hence the stopper 11 is normally closed also by the spring 40.

In describing the operation of the mechanism, I will use the term "depress" and "raise" or words of similar meaning, to designate movement of a key or stopper toward the instrument body, and away from the body, respectively, without regard to the absolute directions in which the parts being described move. When the finger piece or key 38 is depressed, the stopper 13 is raised, but the stopper 11 remains closed. When the thumb key 37 is depressed, the wiper or cam arm 35 is raised, thus raising the carrier arm 23 of the floating lever. If the key 38 is left alone at this time, the register hole is opened, since the closing force exerted on stopper 11 by the spring 40 is stronger than the closing force exerted by spring 30 through arm 27, floating lever, and arm 14 on the stopper 12. But if, when the thumb lever 37 is depressed, the key 38 is depressed also, the stopper 11 is opened and the stopper 12 remains closed, because then the pressure exerted by the arm 27 is applied to that part of the floating lever which is coupled to the stopper 12. If, when the floating lever mechanism is in the position last described, the key 38 is released, its more powerful spring 40 causes it to close the stopper 11 and open the stopper 12 through the medium of the floating lever 21. When the thumb key is released, spring 30 holds both stoppers 11 and 12 closed, whether key 38 is pressed on, or not.

In playing the notes of the lower register the register hole is closed. The topmost note (B-flat) of this register is obtained by opening the stopper 11, the register hole still remaining closed, and this is done by pressing simultaneously on the keys 38 and 37. Depression of the key 38 at the same time opens the stopper 13, thus giving proper resonance to the note B-flat.

I have retained also the trill-keys operated by the fore finger of the right hand, these being keys of the previously used instru-

ment, but I have combined them with my new mechanism in such a manner that when one of them is used in connection with the key 37 the register hole is opened in the old manner. One of the old trill-keys shown is designated 43 and the stopper as 44. Between the new B-flat stopper and the lever of the trill key is a lever mechanism consisting of two arms 45—46, and a sleeve 47 to which they are connected, rotating on a pivot rod of usual construction. The arm 45 overlies one arm of the key lever 43—44, and the arm 46 overlies the stopper 11. Hence when key 43 is depressed to open the stopper 44, it applies pressure on the stopper 11, preventing it from being opened when the key 38 and key 37 are depressed at the same time. This provision is made for the reason that, when using one of these trill-keys to trill on the note B-flat, it is essential to close the new B-flat hole and open the old hole in order to produce the upper note of the trill in tune.

I have already indicated that the principles of the invention may be applied to other woodwind instruments as well as to clarinets. The manner of so doing and any adjustments or rearrangements necessary will be readily understood by those skilled in this art.

What I claim and desire to secure by Letters Patent is:

1. A key mechanism for wood wind instruments having a tubular body, pierced with lateral holes, one of which is a register hole and others are tone holes, stoppers for said holes, a floating lever construction coupled to the stoppers of the register hole and of one of the tone holes, a spring acting on said mechanism tending to close both stoppers, a finger key carrying the stopper of another tone hole and being constructed and spring-pressed to exert closing force on the first named tone hole stopper, and a key connected to the floating lever mechanism and arranged to exert force tending to open the stoppers to which said floating lever is connected.

2. In a wood wind instrument of the character described having a register hole and two tone holes for adjacent notes in the scale, stoppers for said holes, a floating lever articulated to the register hole stopper and to the tone hole stopper for the hole of higher pitch, a carrier for said floating lever operable by a digit of the performer to raise said floating lever, a spring arranged to exert closing pressure at a point on said floating lever between its pivot and its point of connection with the register hole stopper, a key carrying the stopper for the tone hole of lower pitch and having an extension arranged to bear on the stopper for the tone hole of higher pitch, and a spring engaged with said last named key and arranged to

exert closing pressure on the last named stopper superior to the force tending to open it when the first named key is pressed upon.

3. In a wood wind instrument a series of stoppers covering tone holes of different pitches, a single key lever carrying the stopper for the hole of lower pitch and arranged to exert closing pressure on the stopper for the hole of higher pitch, a register hole stopper, a floating lever connected to the second named tone hole stopper and to the register hole stopper, a carrier for said lever to which the lever is pivoted between its points of connection with said stoppers, a digit operated key for raising the floating lever and a spring arranged to exert depressing force upon that arm of the floating lever which is connected to the register hole stopper.

4. In a wood wind instrument a series of stoppers covering tone holes of different pitches, a key lever carrying the stopper for the hole of lower pitch a spring for closing said stopper, said lever having means to exert closing pressure on the stopper for the hole of higher pitch, a register hole stopper, a floating lever connected to the second named tone hole stopper and to the register hole stopper, a carrier for said lever to which the lever is pivoted between its points of connection with said stoppers, a digit operated key for raising the floating lever and a spring arranged to exert depressing force upon that arm of the floating lever which is connected to the register hole stopper, such force however being less than that exerted by the first named spring tending to raise the register hole stopper, through the floating lever, when the floating lever pivot is raised.

5. In a wood wind instrument of the clarinet family, a combined tone hole and register hole key mechanism comprising stoppers for the register hole and the tone hole of highest pitch, a floating lever mechanism articulated to both stoppers and digit-operated to open them and spring-pressed to close them, the closing spring being arranged to act on that arm of the floating lever which is coupled to the register hole stopper, whereby it tends to raise the tone hole stopper when the fulcrum of the lever is raised, and a spring-closed key for another tone hole having means for exerting closing pressure on the stopper of the first named tone hole.

6. In a wood wind instrument of the clarinet family the combination with the usual tone holes and a register hole, of an additional tone hole having the same pitch in the scale as the highest note of the normal lower register of the instrument, a digit-operated floating lever mechanism connected to the stopper of said additional hole and to the register hole stopper, said mechanism be-

ing operable to open the last named tone hole stopper and close the register hole stopper when the stopper for the next lower tone hole is opened.

5 7. In a wood wind instrument of the clarinet family the combination with the usual tone holes and a register hole, of an additional hole having the same pitch in the scale of the highest note of the normal lower register of the instrument, and a digit operated floating lever mechanism connected to the stopper of said additional hole and to the register hole stopper, said mechanism being operable to open the last named tone hole stopper and close the register hole stopper when the stopper for the next lower tone hole is opened, and to close the said additional tone hole stopper and open the register hole stopper by persistence of digital pressure on the said mechanism when said lower tone hole is closed.

8. In a clarinet having a tone hole for the note A-natural and a register hole, an additional hole for the note B-flat, a stopper for said B-flat hole a spring-closed key for the A-natural hole having a presser arranged to exert closing force on the B-flat hole stopper when the A-natural hole is closed, and a floating lever mechanism coupled to said B-flat hole stopper and the register hole stopper, a digit key for said floating lever mechanism and a spring cooperating with said key to close the register hole and open the B-flat hole when the said key is pressed upon and the A-natural key is also pressed upon.

9. In a clarinet having a tone hole for the note A-natural and a register hole, an additional hole for the note B-flat, a spring-closed key for the A-natural hole having a presser arranged to exert closing force on the B-flat hole stopper when the A-natural hole is closed, a floating lever mechanism coupled to said B-flat hole stopper and the register hole stopper, a digit key for said floating lever mechanism and a spring cooperating with said key to close the register hole and open the B-flat hole when the said key is pressed upon and the A-natural key is also pressed upon.

10. In a wood wind instrument, a register hole stopper, a tone hole stopper, a floating lever mechanism coupled to said stoppers, a spring pressed finger key having an abutment arranged to exert closing force on the first tone hole stopper when said key is released, a second finger key controlling a third tone hole stopper and connections between said third key and the first tone hole stopper for closing the latter when the said second key is pressed upon to open its hole.

11. In a wind instrument having a tubular body pierced with lateral holes, one of which serves as a register hole, a key mechanism comprising stoppers, a floating lever connected to the register hole stopper and to

one of the tone-hole stoppers, a spring acting upon one of said stoppers, a carrier upon which the floating lever is pivotally mounted, a second spring acting upon the floating lever to one side of the pivotal mounting, a digit-operated key connected to the carrier, and a second digit-operated key for overcoming the effect of the first-mentioned spring.

12. A key mechanism for wood wind instruments having a tubular body pierced with lateral holes, one of which is a register hole and the others are tone holes, stoppers for said holes, a floating lever engaged with the stopper of the register hole and with the stopper of one of the tone holes, a carrier pivotally supported from the body of the instrument to which said floating lever is pivoted between its points of engagement with the respective stoppers, and by which the pivot of said floating lever is raised and lowered, spring means arranged to apply pressure toward the instrument body on that arm of the floating lever which engages the register hole stopper, and a spring closed tone hole key arranged to apply closing pressure on the tone hole stopper with which said floating lever is engaged.

13. In a wood wind instrument having a lateral register hole and lateral tone holes, a stopper key for said register hole and a stopper key for one of said tone holes pivotally supported from the instrument body with provision for movement independently of one another, a second tone hole key having means for applying closing pressure to the before named tone hole key, a floating lever coupled to the register key and to the first named tone hole key, means operable by the performer's finger for raising the pivot of said floating lever, and means for applying spring pressure toward the instrument body upon said floating lever.

14. In a wood wind instrument having a body tube pierced with lateral tone holes and a lateral register hole, a stopper key lever for the register hole, a stopper key lever for a tone hole near said register hole, a floating lever connected to said keys, digit operated means for raising said lever coupled thereto at a point between its points of connection with the said key levers, resilient means arranged to apply closing pressure to the register hole key lever, and a spring closed digit operated tone hole key having means for applying pressure to the before named tone hole stopper key.

15. In a wood wind instrument having a body tube pierced with lateral tone holes and a lateral register hole, a stopper key lever for the register hole, a stopper key lever for a tone hole near said register hole, a floating lever connected to said keys, digit operated means for raising said lever coupled thereto at a point between its points

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of connection with the said key levers, resilient means arranged to apply closing pressure to the register hole key lever, a spring closed digit operated tone hole key having means for applying pressure to the before  
5 named tone hole stopper key, another digit operated tone hole key, and means operated by said key when pressed upon by the performer's finger for closing the first named tone hole stopper key. 10

In testimony whereof I have affixed my signature.

ALLEN LOOMIS.