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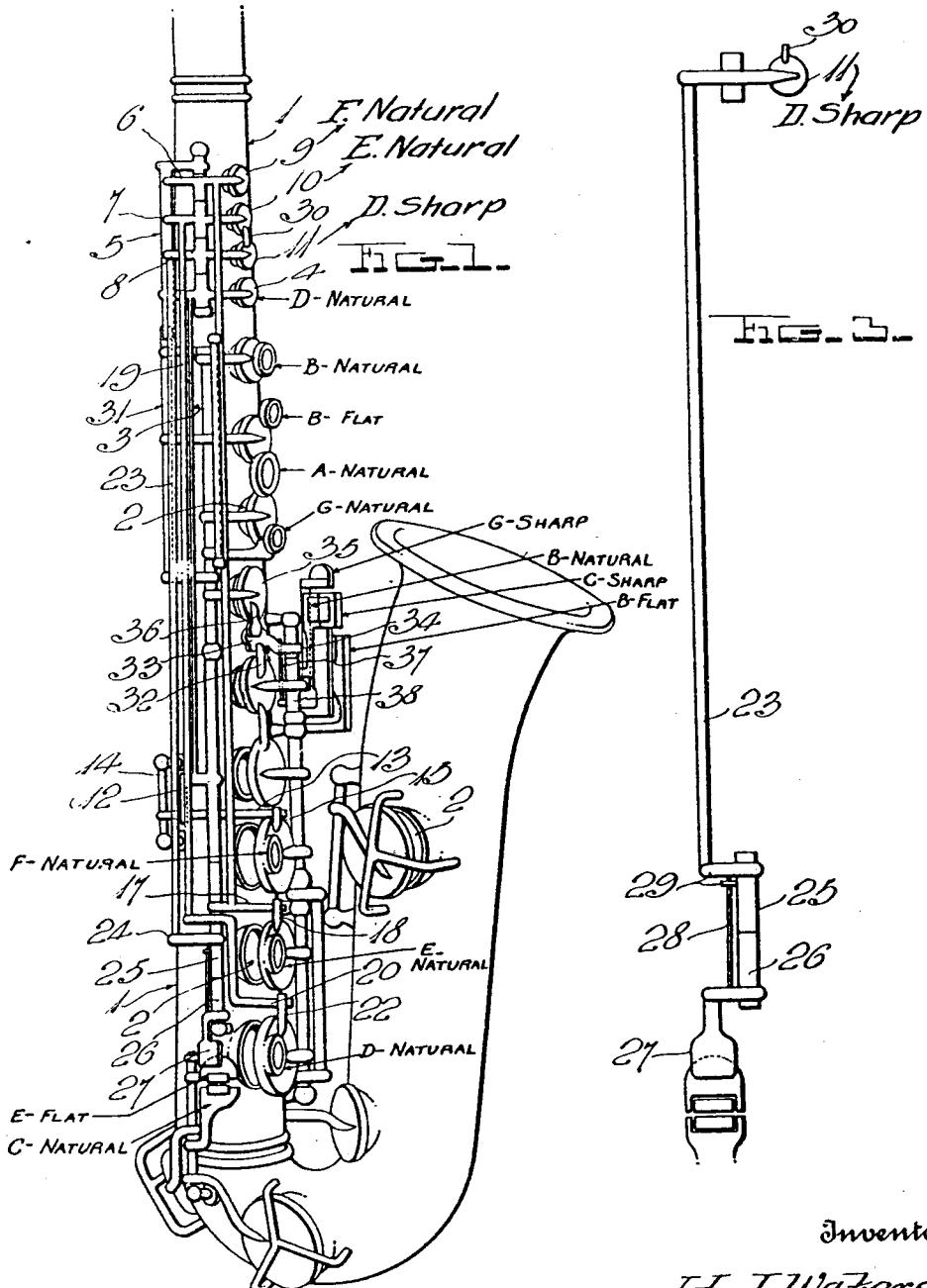
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H. J. WATERS

SAXOPHONE

Filed Sept. 17, 1924

2 Sheets-Sheet 1



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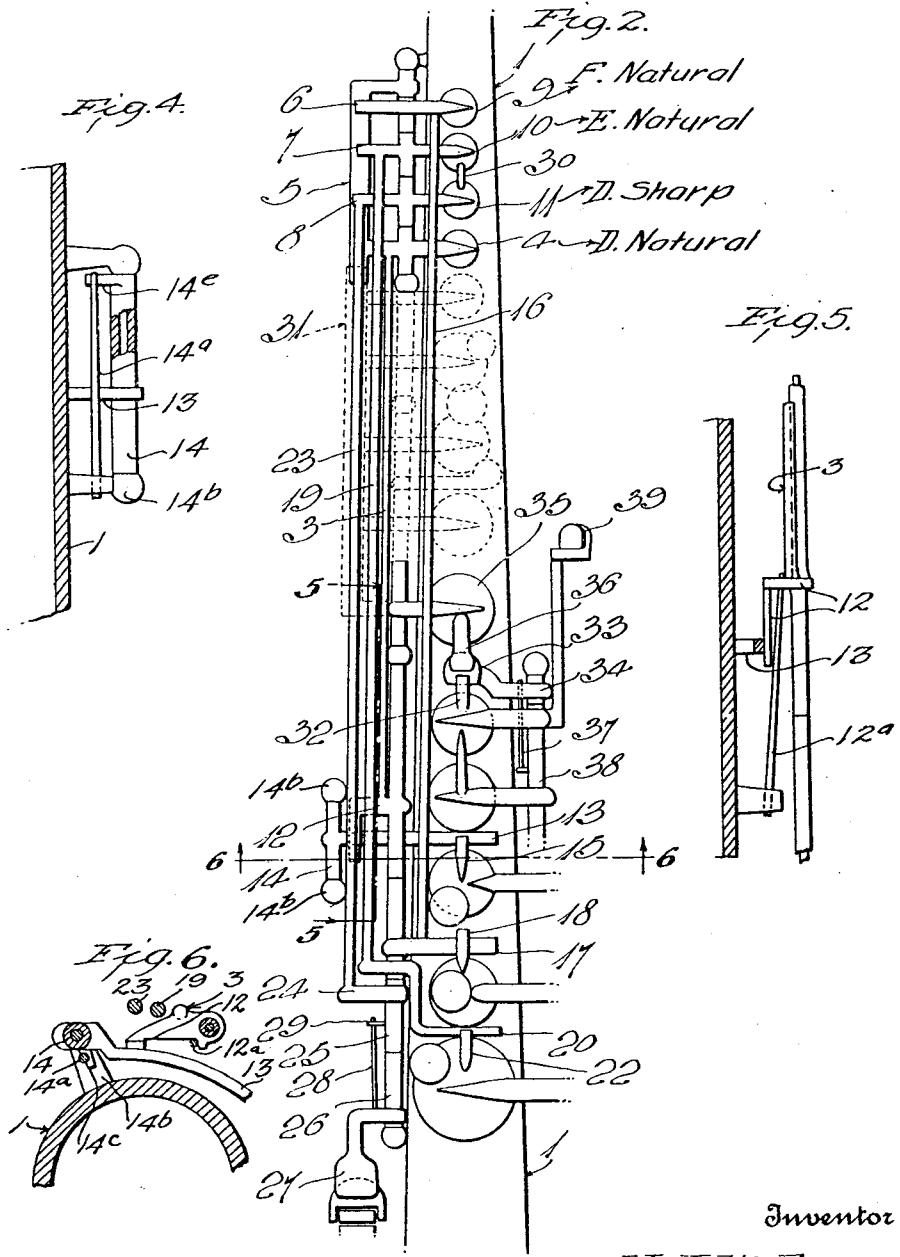
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## UNITED STATES PATENT OFFICE.

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## SAXOPHONE.

Application filed September 17, 1924. Serial No. 738,229.

This invention relates to an improved musical instrument. It relates broadly to that class of inventions known as wood wind instruments, but has specific reference to a novel saxophone.

In order that persons not particularly familiar with instruments of this class may obtain a clear comprehension of the present invention, I am going to allude briefly to the conventional saxophone of the present day. To this end, I would state that all saxophones, so far as I know, from the bass up to the soprano, are fingered substantially alike, the range of tone usually extending from low B-flat to high-F. The thumb of the left hand of the performer rests on a button adjacent an octave key, while the corresponding finger of the other hand engages beneath a hook on the tubing of the instrument. With the hands thus placed, the fingers are positioned over the valves and their operating means. Thus, without bodily shifting or rotating the hands, all valves, with the exception of the side keys operated by the first finger of the right hand, can be operated up to and including high C-sharp. Now, in order to open the remaining valves at the top of the tubing, the left hand must be bodily shifted from its natural position so that the palm of this hand and the inner ends of the fingers can be used. There are three individual valve levers at this point, one being pressed to produce the tone high-D, two keys being pressed simultaneously to make the tone D-sharp. High-E requires the same valves being open and an additional valve operated by the first finger of the right hand. Making high-F requires all three of the top valves to be opened together. Obviously, when rapid passages in music are encountered requiring shifting of the hands and simultaneous opening of the several valves, smooth playing cannot be enjoyed by the ordinary performer.

I do not propose to change the system of fingering. As a matter of fact, it is a feature of my invention to retain, as far as possible, the customary fingering. What I aim to do, is to eliminate the usual individual levers ordinarily actuated by the left hand and to provide a mechanism which will control the four highest tones from the fingers of the right hand. With my arrangement there is absolutely no shifting of the hands. They remain at all times in their

natural positions so that the fingers may act with precision. That a smooth and even tone can be had with this arrangement, cannot be doubted. More specifically speaking, I propose to provide novel operating means for the four valves used for producing the four highest tones on the instrument, the operating means being controllable from the valves operated by the fingers of the right hand, and particularly that valve which is operated by the first finger of the right hand. The arrangement is such that the valves operated by this hand may be utilized for obtaining tones in both registers. For instance, instead of obtaining only the middle-D and low-D with the valves of the right hand, they may be utilized also, with the same fingering, for obtaining high-D also. This is a vital point of importance upon which emphasis should be laid.

The structure provided for carrying the invention into effect is exceedingly novel and positive in operation, and it naturally possesses numerous features and advantages. However, these features and advantages will not be outlined at this time but will appear as the description goes on.

There is another important feature of the invention which I wish to refer to at this time and this is the inclusion of a normally open G-sharp valve. I am aware of a marketed saxophone which possesses this feature, but all other saxophones, so far as I have been able to ascertain, provide mechanism wherein the G-sharp key is normally closed. To the skilled and trained ear, the closed valve arrangement is bad in that it affects the intonation, making the tone A out of tune and also affecting other tones.

With my arrangement, the G-sharp valve is normally held open by spring means and it acts in conjunction with the G-natural valve so that when the scale is being ascended or descended, the G-sharp valve will automatically open and close at the proper time. In the marketed saxophone to which I have referred, a supplemental tone hole and valve are provided for accomplishing the results that I have, without requiring these supplemental parts.

In the accompanying drawings forming a part of this application and in which like numerals are employed to designate like parts throughout the same:

Figure 1 is a perspective view of one side of a saxophone including my improved mechanism.

Figure 2 is a diagrammatic top plan view showing the improved mechanism thrown out in a plane to one side of the body to show more clearly the relation of parts.

Figure 3 is a detail plan or elevation of the D-sharp valve and its operating mechanism.

Fig. 4 is a detail fragmentary side view partly in section showing the arrangement of the spring for rotating the sleeve which actuates valve controlling parts.

Fig. 5 is a similar view taken on the broken line 5-5 of Fig. 2, showing the arrangement of the spring which actuates one of the valve shafts.

Fig. 6 is a transverse sectional view taken on the broken line 6-6 of Fig. 2 to further illustrate the arrangement of the aforementioned springs and the parts actuated thereby.

Referring to the drawings in detail, the reference character 1 designates the conventional tubing or body of the instrument which is provided with the longitudinally spaced tone holes 2. As is usual, a multiplicity of valves and operating shafts and keys act in conjunction with these tone holes for producing the various tones of the scale. The saxophone has a range of tone extending from low-B flat to high-F natural as before stated. For the sake of clearness, I am designating the tones produced by the several valves seen in the drawing. To avoid confusion however, I have followed this practice only in Fig. 1.

The improved mechanism which I employ comprises in the main a rotatably mounted shaft 3 which I am going to designate as the master shaft. Observing Fig. 2, it will be seen that this shaft 3 is connected at its upper end to the valve 4 (D natural). At this same end, the shaft is connected to a U-shaped portion 5 which is rockably mounted as shown and which underlies the extensions 6, 7 and 8 of the valves 9 (high-F), 10 (E natural), 11 (D-sharp), respectively. At its lower end, the shaft 3 is provided with a crank arm 12. The free end of this arm rests slidably on an arched or arcuate arm 13 which is connected with a sleeve 14 rotated by a spring 14<sup>a</sup> attached at one end to one of the sleeve supporting posts 14<sup>b</sup>, the free end of the spring bearing against a short crank arm 14<sup>c</sup> on the sleeve as clearly shown in Fig. 4 of the drawing. At this point, I wish to direct attention to the fact that the spring 14<sup>a</sup> which acts on the arm 13 serves to normally hold the latter up, that is in a direction away from the body of the instrument. Now, the shaft 3 is provided with an individual spring 12<sup>a</sup> which acts on the crank arm 12, as clearly shown in

Figs. 5 and 6 of the drawing to rotate this shaft in a direction from right to left and to swing the valve 4 to open position. The spring acting on the sleeve 14 however, is very strong and overbalances the spring last mentioned and counteracts the same so as to normally hold the valve 4 closed. The F-valve is provided with an extension 15 which overlies the free end of the arm 13 for a purpose to be hereinafter made apparent. Disposed on the right hand side of the shaft 3 is another shaft 16, this being connected at its upper end to the valve extension 6 and being provided at its lower end with a laterally extending arm 17 which underlies an extension or finger 18 on the E-valve on the lower portion of the instrument. Disposed on the opposite side of the master shaft 3 is a further shaft 19 which is connected at its upper end to the valve extension 7 and is provided at its lower end with a crank arm 20, the free end of which underlies an extended finger 22 on the low-D valve. Next to the shaft 19 is another shaft 23, this shaft being rigidly connected at its upper end to the valve extension 8 and being provided at its lower end with a laterally directed portion 24 carrying a sleeve 25. A butting the sleeve 25 is another sleeve 26 to which a finger-piece 27 is connected. As seen in Figs. 2 and 3 more clearly, the finger-piece 27 is equipped with a needle spring 28, the free end of which engages with a hook 29 carried by the sleeve 25. The finger-piece 27 overlies the finger-piece for the low-D-sharp key. These parts are separately operable however. It is to be noted that the valve 11 is provided with an extension 30 which overlies the valve 10 so that when the latter opens, it will also open the valve 11. The shafts 16, 19 and 23 are, like the master shaft, equipped with individual springs, the tension of which is directed in a manner to normally swing the valves which they operate to open position or in a direction from right to left.

Assuming that the instrument is idle, it will be seen that the arched arm 13 will act to rotate the shaft 3 in a direction from left to right against the tension of the individual spring with which the shaft 3 is provided. In so doing, the U-shaped part 5 will be lifted, simultaneously engaging the valve extensions 6, 7 and 8 and closing the several valves 9, 10 and 11 and 4 against the tensions of their springs. With the parts in this position, the tones will be produced in the usual way, the improved mechanism not interfering with the production of low-D, middle-D, etc. Here, I might direct attention to the fact that the portion 31 (already existing on the present day saxophones) underlies an extension on the U-shaped part 5 as seen more clearly in Fig. 2. Now, so long as any one

of the fingers of the left hand is down, this part 31 refuses to allow the U-shaped part 5 to rock in a direction from right to left. Hence, the high tones are inoperative until 5 the fingers of the left hand are lifted off of the keys. As soon however, as all of the fingers of the left hand is raised, the springs already existing move the part 31 away from the part 5, permitting the latter to operate 10 freely. Assume now that the three fingers of the right hand are down on the valves F, E and D. It is obvious that when this takes place, the finger 15 serves to press downwardly on the free end of the arm 13, moving it toward the body of the instrument and at the same time moving it away from the crank 12 on the master shaft 3. As soon as this happens, the master shaft under the action of its own spring rotates in a direction 15 from right to left and moves the U-shaped part 5 away from the valve extensions 6, 7 and 8. The valves may now be selectively operated. Since the shaft 3 is connected with the valve 4, it is obvious that 20 the tone high-D is produced. Should it be desired to produce high D-sharp, the little finger of the right hand is pressed upon the finger-piece 27. The spring 28 which bridges the sleeves 25 and 26 serves to impart 25 rotation in a direction from right to left to the shaft 23 which in turn serves to open the valve 11. To form high-E, the third finger of the right hand is lifted up and the little finger is raised if desired. Raising of the 30 third finger releases the crank arm 20 permitting the shaft 19 which it controls to rotate in a direction to open the valve 10. As the valve 10 opens, it bears upwardly on the finger 30 carrying the valve 11 up too. It is 35 essential that the last named valve open with the valve 10 so that the note will be in tune. Now, if the second finger of the right hand is raised, it will release the arm 17 and the shaft 16, thus opening the valve 9. Now, all 40 of the valves at the top of the instrument are open and the highest tone (high-F) is formed. Thus, it is clear that with the same finger utilized for forming the tones low-D, middle-D, etc., is also used for forming the 45 high tones high-D, D-sharp, etc. It is to be borne in mind that in order to permit the improved mechanism to operate, it is essential to lift the fingers of the left hand. As soon as any one of the valves operated by 50 this hand is closed, it renders the improved mechanism inoperative for the time being and permits the desired tones to be formed without interference from the upper valves. The method of operation of the parts so far 55 described is thought to be clear and a more lengthy description of this much of the invention is deemed unnecessary.

It has been before intimated that the invention also includes a unique improvement 60 with respect to the G-sharp valve. I direct

attention to Fig. 2 wherein it will be seen that the G-sharp valve is provided with a finger or extension 32 which overlies a head 33 on the inner end of a spring-lifted arm 34. As it is the normal tendency for the arm 34 to move away from the body of the instrument, it is obvious that it serves to hold the valve normally open. It is to be noted that the G-valve numbered 35 is also provided with a finger 36 which overlies and co-acts 75 with the head 33. The valve 35 is controlled from the finger-piece marked G in Fig. 1. It is to be further noted that a needle spring 37 is anchored at one end to the arm 34 and is connected at its opposite end to the rotary 80 sleeve 38. Since the G-sharp valve is mounted on the sleeve 38, it is obvious that when the G-natural valve is closed, it will move the finger 36 downwardly, pressing down on the shaft 34 which, through the 85 medium of the spring 37, will rotate the sleeve 38 in a direction to close the G-sharp valve. Thus, the tone G-natural may be made without hindrance or interference from the improved mechanism. Should it be desired to form G-sharp when the G-natural valve is closed, the finger-piece 39 will be 90 pressed upon by the little finger of the left hand, this finger-piece being connected to an operating rod which has rigid connection 95 with the sleeve 38 to rotate the latter in a direction from left to right to open the G-sharp valve.

Having set forth the detailed structure and arrangement of parts employed for carrying out the two vitally important features of the invention, and having disclosed the operation of each feature, I believe that a more lengthy description is unnecessary.

Before closing, I would direct attention to the fact that while I have shown a specific embodiment of the invention, I wish it to be understood that various changes in the arrangement of parts, size and shape may be resorted to, so long as the changes do not depart from the scope of the adjoined claims.

I claim:—

1. A saxophone embodying a mechanism of the class described, said mechanism including operating means for the valve utilized for producing the tone high-D, said operating means comprising a rotatably mounted shaft connected at one end to the valve and provided at its opposite end with a sleeve, a finger-piece provided with a second sleeve having its inner end arranged in abutting relation with the corresponding end of the first named sleeve, a needle spring carried by said finger-piece, and a hook carried by the first named sleeve, the free end of said spring being connected with said hook.

2. A saxophone embodying a mechanism of the class described, said mechanism comprising a rotatably mounted master shaft, a

rockably mounted arm, a spring for forcing said arm in a direction away from the body of the instrument, a crank arm carried by said master shaft and bearing slidably upon said arcuate arm, said master shaft being provided at its outer end with a U-shaped portion which is integral therewith, said shaft being also provided with an individual spring, and a plurality of auxiliary operating shafts for co-acting valves, said shafts being engaged with and controlled by said master shaft.

3. A saxophone provided with a mechanism of the class described, said mechanism comprising a spring rotated and rotatably mounted master shaft, means for preventing rotation of said shaft, a plurality of auxiliary and independently operable shafts in association with said master shaft, all of said auxiliary shafts being provided with individual springs for moving the valves controlled thereby to open position.

4. A saxophone provided with a mechanism of the class described, said mechanism comprising a rotatably mounted master shaft adapted to rotate in a predetermined direction, a movably mounted arched arm extending beneath said master shaft and normally moved in a direction away from the body of the instrument to prevent rotation of said master shaft, said master shaft being provided at its upper end with a U-shaped portion which is integral therewith, a plurality of valves provided with lateral extensions overlying the bight portion of said U-shaped portion, auxiliary shafts connected to said valve extensions

and disposed in parallelism with the body of the instrument, means for rotatably mounting said auxiliary shafts, said auxiliary shafts being provided at their lower ends with laterally extending fingers overlying the body of the instrument and adapted to be controlled by certain of the valves mounted on said body.

5. A saxophone provided with a mechanism of the class described, said mechanism comprising a rotatably mounted master shaft provided at its lower end with a crank arm and provided at its upper end with a substantially U-shaped portion, a valve including a lateral operating extension integral with said master shaft; an arched arm rockably mounted on the body of the instrument and underlying said crank arm, said arched arm being provided with spring means for rotating the master shaft in a predetermined direction to maintain said valve normally closed, a plurality of additional valves in association with said first named valve, said valves being provided with lateral extensions, the free ends of which overlie the bight portion of said U-shaped portion, operating shafts extending at right angles to said valve extensions and provided at their lower ends with lateral fingers overlying the body of the instrument, certain of the valves at the lower end of the instrument being provided with extensions overlying said fingers for operating the same.

In testimony whereof I have hereunto affixed my signature.

HARRY J. WATERS.