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A. TSCHOFEN.
KEY SYSTEM FOR MUSICAL INSTRUMENTS.

APPLICATION FILED SEPT. 30, 1901.

NO MODEL.

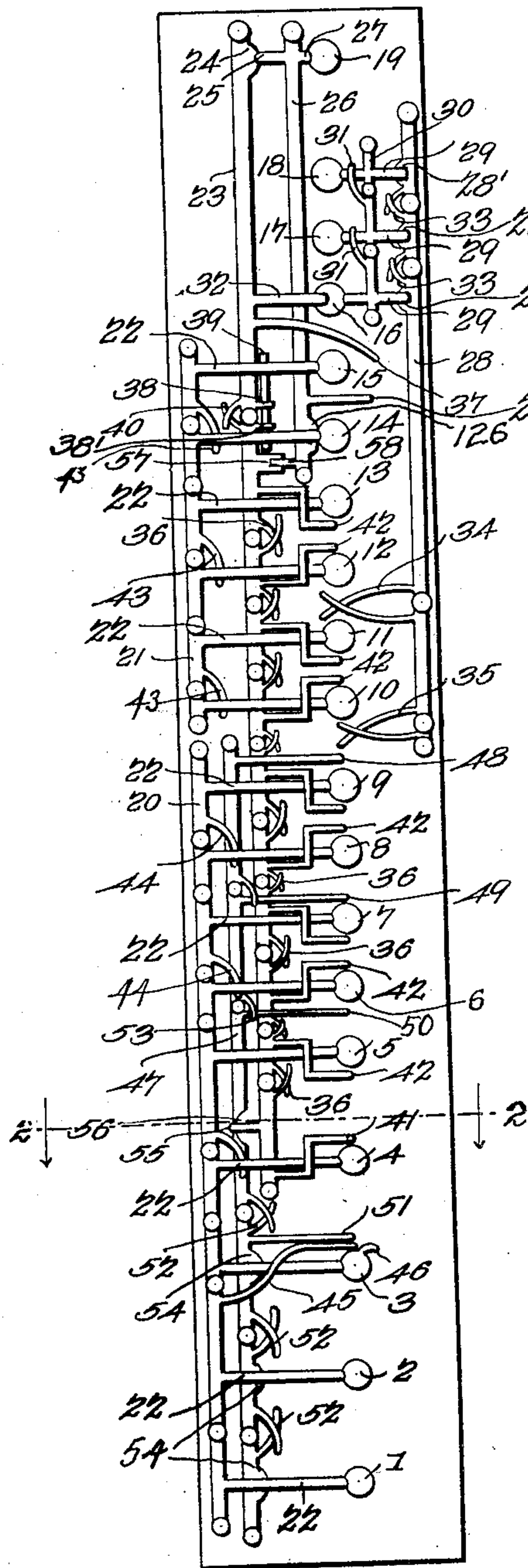
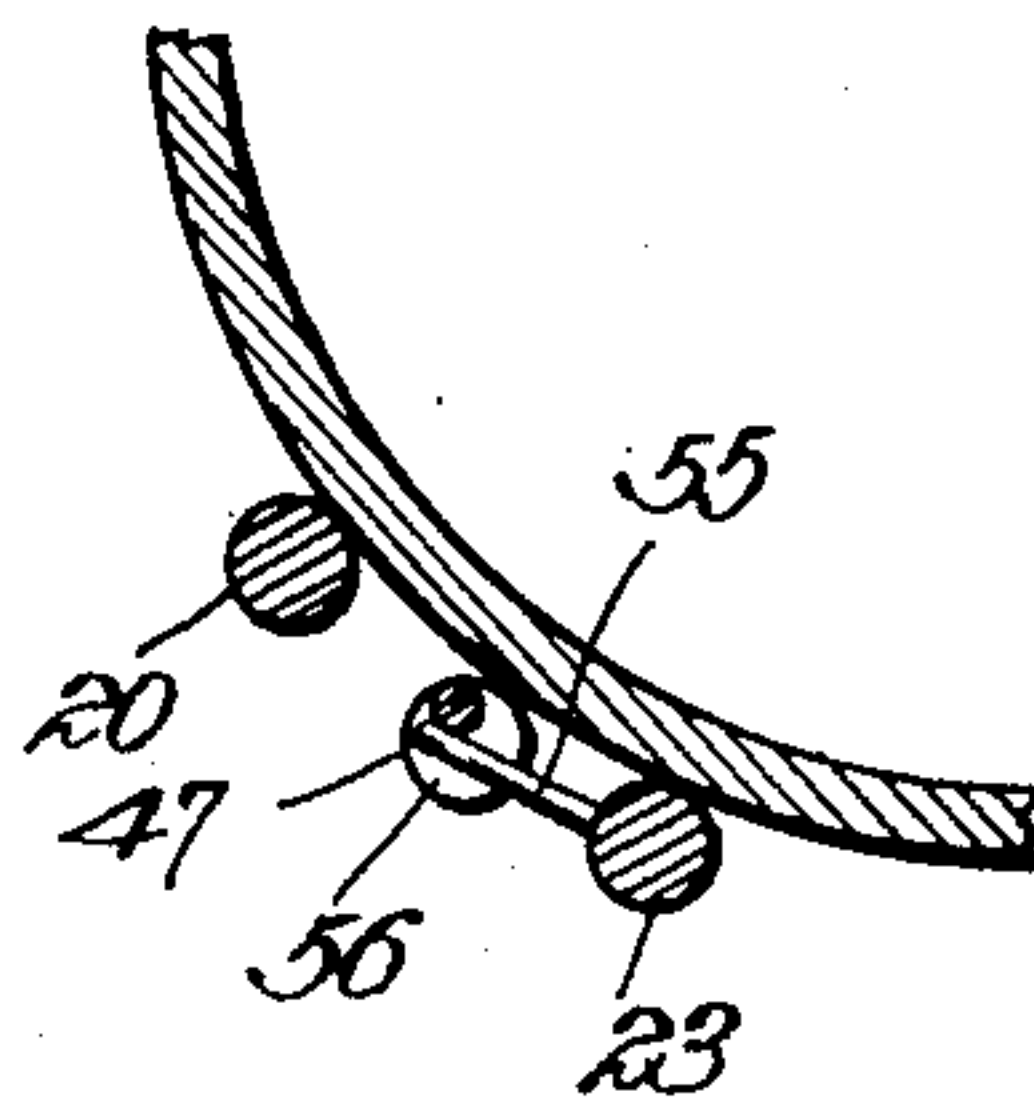


Fig. 1.

Fig. 2.



Witnesses
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KEY SYSTEM FOR MUSICAL INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 742,102, dated October 20, 1903.

Application filed September 30, 1901. Serial No. 77,118. (No model.)

To all whom it may concern:

Be it known that I, ANTON TSCHOFEN, a citizen of the United States, residing at Carver, in the county of Carver and State of Minnesota, have invented a new and useful Key System for Musical Instruments, of which the following is a specification.

This invention relates to a key system for musical instruments, particularly reed instruments; and the object of the invention is to provide a simple and efficient system of keys which will facilitate the operation of the instrument in the production of more perfect tones and enable a performer to more readily master difficult musical passages and to control the keys or the stops for the holes at several points intermediate of the length of the key system to afford convenience in fingering.

The invention consists in the construction and arrangement of the several parts, as will be more fully hereinafter described and claimed.

Figure 1 of the drawings represents a plan view or development of the system of keys arranged in relation to the holes of an instrument and embodying the improved features of the invention, and the rectangle there illustrated corresponds to the complete circumference of the tube or instrument to which this invention is applied. Fig. 2 represents a transverse section taken on line 2 2 of Fig. 1.

In the drawings is shown the body of an instrument having nineteen holes disposed in a longitudinal series at the center thereof. These holes are provided with stops, numbered from 1 to 19, the operating mechanism of which is disposed in compact form on opposite sides of the series of holes, so as to concentrate said mechanism and have the parts thereof in contiguity and bearing relation for simultaneous operation and controlling actuation. The stops from 1 to 15 are normally held open, and the stops 16 to 19 are normally held closed by means hereinafter to be described. Disposed on the instrument at one side of the series of holes are two series of longitudinally-disposed shafts 20 and 21, the series 20 being longer than the series 21 and arranged in longitudinal alinement therewith. Each of these shafts is supported in

suitable bearings to rotate or rock independently. Each shaft has an arm 22 extending laterally therefrom, and each arm carries at its free end one of the stops before mentioned. There are nine shafts 20, which carry the stops 1 to 9, inclusive, and the series 21 consists of six shafts, which carry the stops from 10 to 15, inclusive. These nineteen stops are provided with the usual springs, some of which tend to hold their respective stops open and others to hold them closed. These springs are well known and no illustration thereof is needed.

A series of independent rocking shafts 23 is located inside the line of shafts 20 and 21, between them and the series of holes, and extends in longitudinal alinement from the upper limit of the system downwardly under the various arms 22 of the shafts 20 and 21 and terminates below the arm 22, carrying the stop 4. The uppermost shaft 23 of the series has a cam 24 at its upper end, which is adapted to engage and operate a projecting finger 25 on an auxiliary rod or shaft 26, which extends parallel with the shafts 23 and on the same side of the series of holes. This shaft 26 is located at the upper end of the system between the series of holes and the shafts 23 and is provided at a point opposite the finger 25 with a laterally-extending arm 27, carrying at its free end the uppermost stop 19 of the series. This stop 19 is held normally closed against the tension of its spring by means of the cam 24 on the top shaft 23, the spring of which is stronger than the spring of the stop 19, and this stop 19 is opened by its spring when the finger 25 is released from engagement with the said cam 24. Hence the operation of the top shaft 23 to close the other stops of the series causes the release of the finger 25 from the cam 24 and permits the stop 19 to open. When it is desired to close the stop 19 simultaneously with the other stops of the series after the shaft 23 has been actuated to close said stops, a finger-piece 26', which projects from the shaft 26 in the space between the stops 14 and 15, is depressed.

On the opposite side of the series of holes are arranged three short longitudinally-alined bars, as 30, carrying on one side thereof adjacent the series of holes the stops 16, 17,

and 18 and on the opposite side arms, as 29, extending in an opposite direction to said stops. The two lower shafts 30 of this series have upwardly - extending curved fingers 5 which overlie the stems of the stops 17 and 18, respectively, by means of which the depression of the stop 16 will cause the simultaneous depression of the stops 17 and 18, and depression of the stop 17 will also close 10 stop 18, 18 being adapted to be closed independently of the other two. On the same side of the series of holes is disposed a series of rods, as 28, arranged in longitudinal alignment with each other and parallel with the 15 shafts above described. The three upper rods of the series 28 are provided with cams, as 28', for engaging the arms 29 on the adjacent bars 30. The three upper rods of this series are also provided with reversely-curved 20 terminal fingers 33, the fingers on one shaft overlapping those on the shaft next adjacent and adapted to engage with each other and produce the coöperative movement of the rods. These pairs of fingers 33 stand normally slightly apart, and before their respective rods can be operated this space must be overcome. The stops 16, 17, and 18 are held normally closed against the tension of their springs by means of the cams 28' 30 on the spring-supported rods 28, the springs of said rods being stronger than those of the bars 30. The stop 16 may be opened by rotating the rod 28 connected therewith until the finger 33 thereof engages the finger 33 of 35 the rod next above it, which releases the arm of the bar carrying the stop 16 and permits the spring of said bar to open said stop 16. The further rotation of the rod 28 will turn the rod next above the rod first operated, and 40 the arm of the bar carrying the stop 17 will be released from engagement with the cam on said rod and said stop 17 be opened by the tension of its supporting-spring, and the still further rotation of the rod 28 will cause the 45 second pair of fingers 33 to engage and release the arm of the stop 18 and cause it to be opened by its spring. The three lowermost rods of this series 28 are provided with two pairs of cross-fingers 34 and 35, adapted 50 for engagement to cause the simultaneous operation of the adjacent rods and which project between the stops 9 and 10 and 11 and 12, respectively, the cross-fingers 34 and 35 being employed to actuate the series of rods 55 28 and to control the stops 16, 17, and 18 from a point intermediate of the key mechanism.

The shafts 23 have curved cross-fingers 36 at their terminal ends, the finger on the upper end of one shaft overlapping the finger on 60 the lower end of the adjacent shaft above it for causing the coöperation of said shafts when all the shafts of the series are to be actuated simultaneously. Projecting toward the series of holes from the upper shaft of the 65 series 23 is an elongated finger-piece 37, disposed adjacent to the spring-finger 32 of said shaft. Below the finger-piece 37 two adja-

cent shafts of the series 23 are provided with a pair of laterally-extending projections 38 38', which bear upon a spring 39, suitably 70 supported on the body of the instrument, the said shafts 23 being held in raised position by said spring 39 against the tension of their springs, which tend to hold them in downturned position, the spring 39 being stronger 75 than said shaft-supporting springs. The spring 39 thus holds the shafts 23 in raised position, and when the finger 37 is depressed the spring 39 is pressed down, and the shafts 23 below said finger-carrying shaft are re- 80 leased and under the action of their springs move downward, and by means of the fingers 41 42, carried thereby, which overlap the stems of the stops from 4 to 13, carry said stops down and hold them in closed position. 85 The two adjacent shafts of the series 23, carrying the projections 38 and 38', are provided with overlapping cross-fingers 40, extending in an opposite direction to the projections carried thereby and which are adapted to cause 90 the coöperative movement of said shafts.

The lowermost shaft of the series 23 is provided with a finger-piece 41, which is preferably provided with an offset terminal for overlapping the stem of the stop 4, which is adapted 95 to be actuated by the performer from the lower portion of the system to operate the entire series of shafts 23 without requiring the inconvenient placing of his fingers at a higher point on the system. Above said finger- 10 piece 41 the several shafts 23 are also provided with other similar finger-pieces 42, which overlie the arms 22, carrying the stops 5, 6, 7, 8, 9, 10, 11, 12, and 13, the said finger-pieces 42 being alternately projected up- 105 wardly and downwardly, so that their free ends will be disposed in contiguous pairs. The finger-pieces 41 42 extend from the individual shafts 23, and by reason of the crossing of the fingers 36 the depression of a single 110 finger-piece 41 42 will operate all of the shafts 23 above the shaft carrying the finger-piece which is depressed and the stops connected with said shafts.

The finger-piece 37 is adapted to rotate the 115 uppermost section of the series 23 beyond the point of rotation, which can be effected with the finger-pieces 41 42. This rotation effected by key 37 turns the cam 24 out of engagement with finger 25 and causes the cam 120 126 to elevate stop 14, the lug 57 having first been moved out of engagement with lug 58 by depressing one of the finger-pieces 41 or 42. The spring 39 also extends under the stems of stops 14 and 15 and holds these stops 125 normally open against the tension of their springs. The alternate shafts of the series 21 also have curved operating-fingers, as 43, which extend under the arms 22, carrying the stops 10, 12, and 14, and are operated by the 130 said arms 22 to properly control the stop devices carried by the shafts, on which they are mounted in relation to the holes covered by said stops 11, 13, and 15. The alternate

shafts of the series 20 are also provided with similar fingers, as 44, which extend under the arms 22, carrying the stop devices 4, 6, and 8, and have the same function and operation as the arms 43. One of the shafts 20 is also provided on the side adjacent the series of holes with an upwardly-curved operating-key or finger-piece 45, which crosses over the arm 22, carrying the stop device 3, and a lug 46 is located on said stop adjacent to the inner end of the finger-piece 45 over the hole covered by stop 3.

Between the series of stop-carrying shafts 20 and the series of stop-operating shafts 23 and extending from a point opposite the upper shaft of the series 20 to a point opposite the lower shaft of said series and in parallel relation to both series 20 and 23 is an intermediate series of key-carrying shafts 47, designed to operate the stops 1, 2, and 3 from different points of the system, one of these shafts having an upper laterally-extending key or finger-piece 48, projecting toward the series of holes about midway the system, and lower finger-pieces or keys 49, 50, and 51 of a similar nature arranged at intervals for actuating the said shafts 47 from different points and adjacent certain holes of the instrument, as shown, the said shafts 47 being adapted for simultaneous actuation by means of lower overlapping curved fingers 52 and upper downwardly-extending single fingers 53, which project over the finger-pieces 49 and 50. The three lower shafts of the series 47 are provided with cams 54, which lie under and are adapted to engage the arms 22, carrying the stop devices 1, 2, and 3, and normally hold the said stop devices 1, 2, and 3 in open position. The lowermost shaft 23, which carries the operating-finger 41, overlying the stem of the stop 4, has a finger 55 projecting toward the series of shafts 47 and extending over one of said shafts 47, the latter being provided with a notch 56 to receive said finger 55, so that when the shaft 47 turns or rocks by depression of one of the finger-pieces carried thereby the finger 55, engaging therewith, is forced upward and the shaft 23, which carries said finger, is rocked on its bearings, and the stop 4, actuated by said finger-carrying shaft 23, is closed. Hence it will be obvious that this notched shaft has a crank action, the throw of the finger 55 being regulated by the size of the shaft 47. Hence when the finger-piece 50 is depressed the shaft 23, carrying the operating-finger 42, overlying the stem of stop 6, will be rocked to close said stop 6, and the notched shaft 47, which carries the finger-piece 50, on being turned will throw the finger 55 upward and rock the shaft 23, carrying the operating-finger 41, which overlies the stem of stop 4, and cause said finger 41 to bear downward on the stem of stop 4 and close it simultaneously with stop 6, leaving the intermediate stop 5 undisturbed.

One of the shafts 23 near the upper end of the series has a lug 57 extending toward the

series of holes and underlying a reversely-projecting finger 58 on the shaft 26, so that said shaft 26 may be held against rotation until the shaft 23 is depressed by one of the fingers 41 42.

In the operation of this improved key system the stops 1, 2, and 3 are normally held in open position against the tension of their springs by means of the cams 54 on the three lower shafts of the series 47, which shafts are held in raised position by means of their supporting-springs, the springs of the shafts 47 being stronger than those of the stops 1, 2, and 3, the tendency of the stop-springs being to close said stops. The shafts 47 extend to a point about the middle of the system, and the keys or finger-pieces 48, 49, 50, and 51 thereof are adapted for use from different points of the instrument to close said stops 1, 2, and 3 by removing the cams 54 from engagement with the stems thereof and allowing the springs of said stops to close them. The finger-piece 48 has a shaft-rotating capacity sufficient to release the cam 54 from engagement with the stem of stop 3 and permit the spring of said stop to close it, said finger-piece being adapted to close all the stops above 3 except stop 19 by means of the crank action of the finger 55 and notch 56. The finger-piece 49 has the same power as 48, but rotates farther to close stop 2 in addition to the others, and finger-piece 50 rotates still farther to close stop 1. The stops 4 to 13, inclusive, are held normally open by their springs. The stop 19 is held normally closed by means of the cam 24 of shaft 23 underlying the finger 25, the spring of the top shaft 23 being stronger than the spring of stop 19. The stop 14 is normally held open against the tension of its spring by the spring 39, which extends under the stem of said stop and is opened by the cam 126 on the shaft 26, which cam underlies the stem of said stop 14, and when said shaft 26 is turned by its spring on the release of its finger 25 from the cam 24 the stop 14 is opened. Hence stops 19 and 14 are opened simultaneously on the closing of the stops 4 to 13 and 15 by the depression of the finger 37. The stop 15 is held normally open by its spring and by means of the spring 39, which lies under the stem of stop 15. The closing of stop 14 depresses the finger 43 and forces the stop 15 in closed position against the tension of its spring. Under normal conditions the finger or projection 38' exercises leverage on the spring 39 when the shafts 23 are operated through the fingers 41 42. The projection 38', lying in a plane above the projection 38, comes in contact with said spring 39 only on the depression of the finger-piece 37, and the depression of said finger-piece 37 causes the finger 38 to bear on the spring 39 and press it down out of engagement with the finger 38' and permits the shafts 23, below the top shaft of the series 23, to rock under the action of their springs and close the stops from 4 to 13. This depression of finger 37

also releases the finger 25 of shaft 26 from the cam 24 and permits the stops 19 and 14 to open. The shafts 23 may be operated against the tension of the spring 39 to close said stops 4 to 13 by depressing any one of the fingers 41 42. The stops 16, 17, and 18 are held normally closed by the cams 28', which engage the arms 29 and which are disengaged from said arms to open said stops in the manner hereinbefore described. The finger 32 is designed to depress stop 16 when it is relieved of pressure from shaft 28 and through the fingers 31 to simultaneously close stops 17 and 18 by depressing any of the fingers 41 42.

From the foregoing it will be understood that some of the holes are open at all times, except when closed by the stop engaging therewith by the actuation of its controlling mechanism, and others of said holes are normally closed and are opened by the actuation of the proper mechanism. The great advantage arising from this system of keys is the convenient means afforded for easily finger-
ing the keys and controlling stops distant from others without materially changing the position of the fingers. Thus it will be seen that the stops from 1 to 13 are normally held open and the stops 14 to 19 are normally held closed.

I claim as my invention—

1. A wind instrument having a longitudinal series of holes, shafts carrying stop devices for said holes, one of said stop-carrying shafts having a cam for engaging the stem of one of said stop devices, a series of independent, longitudinally-alined rocking bars disposed on the opposite side of said series of holes and having stop devices for a plurality of said holes secured thereto, said bars having arms extending in an opposite direction to said stop devices, and means to engage said arms to actuate said stops.

2. A wind instrument having a longitudinal series of holes, a series of longitudinally-alined shafts having projecting stems, stop devices for a plurality of said holes carried by said stems, a plurality of said shafts having curved fingers extending under the stems of the stops of adjacent shafts, a plurality of cam-carrying shafts disposed adjacent to said stop-carrying shafts, the cams thereof being adapted to engage the stems of a plurality of said stops to actuate said stops when the cam-carrying shafts are operated, and a series of longitudinally-alined rocking bars carrying stops on one side, and arms on the other side, a series of longitudinally-alined rods disposed adjacent to said rocking bars and having cams for engaging the arms on said bars, and means for operating said cam-carrying rods.

3. A wind instrument having a longitudinal series of holes therein, a series of longitudinally-alined independently-movable shafts, provided with projecting stems having stops at the free ends thereof, curved fingers disposed on alternate shafts of said series and

underlying the stems of adjacent stops, a series of independent longitudinally-alined stop-operating shafts disposed between said holes and said series of stop-carrying shafts, means for causing the simultaneous actuation of the shafts of said stop-operating series, and reversely-bent finger-pieces connected with said stop-operating shafts and adapted to engage the stems of said stops, said finger-pieces being arranged in pairs with the free ends of each pair disposed between two adjacent stops.

4. A wind instrument having a longitudinal series of holes therein, a plurality of series of longitudinally-alined independently-movable shafts disposed on one side of said holes, stops carried by the shafts of one of said series through the medium of stems connected thereto, fingers disposed on alternate shafts of said stop-carrying series and underlying the stems of said stops, the shafts of one of said series carrying operating finger-pieces extending toward said holes, and means for engaging the shafts of said last-mentioned series to cause the simultaneous operation thereof.

5. A wind instrument having a longitudinal series of holes, a plurality of longitudinally-disposed shafts carrying stop devices, a plurality of longitudinally-disposed shafts carrying stop-operating devices, a series of shafts disposed between said stop-carrying shafts and said stop-operating shafts, and provided with a plurality of laterally-extending finger-pieces for operating the various stops from different parts of the instrument.

6. A wind instrument having a longitudinal series of holes disposed therein and provided with a series of longitudinally-alined shafts carrying stops for the majority of said holes, a plurality of said shafts having curved fingers underlying the stems of said stops, a second series of longitudinally-alined shafts arranged parallel with said stop-carrying series and disposed adjacent thereto, a plurality of the shafts of said last-mentioned series having operating finger-pieces projecting therefrom, and the remainder of said last-mentioned series of shafts being provided with cams underlying the stems of the lower stops, each shaft of said second series having a curved finger overlying a member on the adjacent shaft below it, whereby the actuation of one finger-piece of said second series of shafts will operate all of the alined shafts below it, means engaging the stems of a plurality of said stops and actuated by the finger-pieces carried by said second series of shafts, stops for the remaining holes of the series, and means for operating said stops.

7. A key system for a wind instrument having a longitudinal series of holes therein, comprising a series of longitudinally-alined shafts carrying stops for the majority of said holes, a plurality of said shafts having curved fingers underlying the stems of said stops, a second series of longitudinally-alined shafts arranged parallel with said stop-carrying se-

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ries, a plurality of the shafts of said series having operating finger-pieces projecting therefrom, and the remainder of said shafts being provided with cams underlying the stems of the lower stops, each shaft of said series having a curved finger overlying a member on the adjacent shaft below it, whereby the actuation of one finger-piece will operate all of the alined shafts below it, stops for the remaining holes of the series, means for operating said stops, and a third series of longitudinally-alined shafts arranged parallel with the first and second series and disposed between them and the series of holes and extending from the top of the system to a point adjacent one of the lower holes, a plurality of the shafts of said third series underlying the operating finger-pieces of said second series, the uppermost shaft of said series having a cam at its upper end for operative engagement with the top stop, an operating finger-piece carried by said shaft and extending between two of said stops, the remaining shafts of said third series being each provided with a bent finger-piece overlying the stem of one of said stops, said finger-pieces being reversely bent and arranged in pairs with the free ends of each pair disposed between two adjacent stops, each of the shafts of said third series having a downwardly-curved finger overlying an upwardly-curved finger on the adjacent shaft below it whereby the actuation of one of said

shafts will operate all of the alined shafts below it.

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8. A wind instrument having a longitudinal series of holes therein, a series of longitudinally-alined shafts carrying stops for a plurality of said holes, a second series of longitudinally-alined shafts arranged parallel with said stop-carrying series, a plurality of the shafts of said series having finger-pieces projecting therefrom, each shaft of said second series having means for engaging the shaft next below it, stops for the remaining holes of the series, means for operating said stops, a third series of longitudinally-alined shafts arranged parallel with the other series and disposed between them and the series of holes, a plurality of said last-mentioned series being provided with bent finger-pieces overlying the stems of said stops, said finger-pieces being reversely bent and arranged in pairs with the free ends of each pair disposed between two adjacent stops, and curved fingers carried by each of said last-mentioned shafts for engaging a member of the adjacent shaft of said series to cause the simultaneous actuation of the series.

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 In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ANTON TSCHOFEN.

Witnesses:

ANTON MILLS,
 GEO. KNOBLAUCH.