



A.D. 1829 N° 5803.

Wind Musical Instruments.

WHEATSTONE'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, CHARLES WHEATSTONE, late of Number 436, in the Strand, now of No. 20, Conduit Street, Regent Street, in the County of Middlesex, Musical Instrument Manufacturer, send greeting.

5 WHEREAS His present most Excellent Majesty King George the Fourth, by His Letters Patent under the Great Seal of Great Britain, bearing date at Westminster, the Nineteenth day of December, in the tenth year of His reign, did, for Himself, His heirs and successors, give and grant unto me, the said Charles Wheatstone, His special licence, that I, the said Charles Wheatstone,
10 my exors, admors, and assigns, or such others as I, the said Charles Wheatstone, my exors, admors, or assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick-upon-Tweed, my Invention of
15 "A CERTAIN IMPROVEMENT OR CERTAIN IMPROVEMENTS IN THE CONSTRUCTION OF WIND MUSICAL INSTRUMENTS;" in which said Letters Patent is contained a proviso obliging me, the said Charles Wheatstone, by an instrument in writing under my hand and seal, particularly to describe and ascertain the nature of my said Invention, and in what manner the same is to be per-
20 formed, and to cause the same to be inrolled in His said Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said recited Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

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NOW KNOW YE, that in compliance with the said proviso, I, the said Charles Wheatstone, do hereby declare that the nature of my said Invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the Drawing hereunto annexed, and the following description thereof (that is to say):— 5

The wind musical instruments, in the construction of which my said improvements are made use of, are those in which the sounds are produced by directing a current of air against metallic springs or tongues fitted within or over corresponding apertures, formed in plates of metal or of other fit and proper substances or materials, the said springs or tongues being firmly affixed 10 at one end of each to the said metallic or other plates whilst their other ends are permitted to vibrate freely within the said apertures, but without their vibrating parts encountering or touching the sides thereof. Several of these springs, being placed in apertures arranged parallel to each other side by side in a plate, and tuned to the notes of a common chord, constitute one of the 15 simplest forms of a wind musical instrument, known in Germany under the name of the mund-harmonica, and in England by that of the *Æolina*. Finger keys have also been added to such instruments, somewhat similar to those of flutes, but always placed at such distances apart as to allow space for the fingers to apply themselves to each key when the instruments are held in such 20 positions as for the hands to apply themselves thereto in the manner of fingering the flute or flageolet. Now in my improved keyed wind instruments the springs are brought so close together that they occupy little more space than in the *Æolina* before mentioned. In fact eight springs may be placed in the space of an inch and a half, and their corresponding keys may also be brought 25 much closer together than hitherto, and the wind chests made much smaller than has yet been done for a similar number of notes. The modes by which I am enabled to arrange the keys when brought so close together as to be conveniently reached by the fingers will be understood by the references to the various Figures contained in the Drawing, which, as aforesaid, is annexed 30 to this Specification, and in which said Drawing Figure 1 is a view of the right-hand side of one of my said improved instruments, to which I have given the name of the symphonium, Figure 2 an end view, and Figure 3 a top view thereof. Figure 4 is a section taken through the middle of Figure 2, and shewing the tongues or springs *a, a, &c.*, which are affixed at one end upon the 35 inner side of the metal plate *b, b*, and their other ends move or play freely within slits or corresponding perforations made through the plate *b, b*, to receive them, upon the external side of the plate *b, b*, Figures 1 and 3. The valves or keys *c, c, &c.* are mounted much in the same manner as the keys of flutes, and

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they are likewise fitted with springs, as such keys are, but the levers of the keys are made alternately unequal in their length, so that their ends, which are furnished with the studs *d, d, &c.* mounted upon them, lie in two parallel rows, as shewn in Figure 1, by which means the valves or keys *c, c, 5 &c.* may be successively raised by the alternate progressive motion of the first and second fingers of the right hand, and the distances apart of the studs *d, d, &c.* upon the ends of the levers must be such as that each stud may be separately touched by a finger, without that finger interfering with the adjacent studs, and yet so as that any two adjacent studs may occasionally
10 be pressed down by one finger when necessary. The left side of the instrument is likewise to be fitted up with a plate, tongues or springs, and valves or keys, with studs upon the ends of their levers, in a similar manner to those of the right side of it, and as shewn in Figures 2 and 3. The sounds or notes of this instrument are arranged in a diatonic scale, but so that its successive
15 notes are placed alternately on each side of the instrument. The notes produced by touching two adjacent diagonal studs are therefore thirds to each other, and those produced by touching two adjacent studs in the parallel rows are fifths to each other, excepting an additional note *G*, which does not agree with this arrangement. The particular instrument here figured is repre-
20 sented as being in the key at *C*, and its range, extent, or compass limited to two octaves, but it may be tuned in any other key, or increased or diminished in its compass at pleasure. The box, cavity, or wind chest is completed by the addition of three fixed sides and a moveable one, which latter has also the embouchure or mouthpiece affixed in it, as shewn at *e, e, &c.* in Figures 1, 2, 3,
25 and 5, the latter Figure being a section thereof. *f, f,* are handles or plates shaped so as to be conveniently held between the two third and fourth fingers and thumb of each hand. Instead of placing the tongued keys, &c. upon two parallel plates, as in the above-mentioned instrument, I can place them in two separate rows upon one plate only, and as shewn in Figure 6, which is
30 an inside view of an instrument, and in Figure 7, which is an external view of the same, but in this disposition or arrangement a new construction of the keys becomes necessary, so that they may be placed in two parallel rows on each side of the instrument, as shewn at Figure 8, which represents the left side of it. Figure 9 is an under view of Figure 7. The keys *e, e, &c.* are
35 here bent levers, with holes in them at *g, g, &c.*, turning upon pins or wires passed through them, and the standards of the frame plates *h, h, &c.*, which are affixed upon the main plate *b* of the instrument. Each key has also a spring *i*, Figure 10, which acts against a fixed projecting hook *j*, formed upon the top of each standard, as shewn at Figure 11, so as to press the key

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down, and as shewn on the left side of Figure 9. Figure 12 shews the short end of the lever or key as being cleft so as fit upon each side of the standard or fixed support of the hook *j*, and it has other holes made through the upper ends of the cheeks *h, h*, Figure 12, through which a pin is passed, which also passes through a hole *l* formed in the end of a pushing rod *m*, Figure 13, 5 which has a stud *d* affixed upon its outer end, and this pushing rod *n* upon being pressed inwardly acts upon the shorter end of the key *e*, and lifts or raises it, the reaction of the spring *i* against the fixed hook *j* depressing it, when set at liberty, as before mentioned. Figure 14 represents a longitudinal view of the frame plate *h*, with its standards *h, h*, &c., and a wire passing 10 through holes made in the lower part of each standard upon which the bent levers or keys *c, c*, &c. turn, in order to place the studs *d, d*, &c. upon the external ends of the pushing rods *m, m*, &c. in their proper positions for fingering them in the manner above mentioned. In describing the former instrument the pushing rods are alternately bent in two opposite directions, 15 and as shewn in Figures 13 and 15, and in their places in Figure 9. The pushing rods pass through slits made in the plates forming the sides of this instrument, as shewn in Figure 8, and the ends of which said slits are closed by corresponding plates furnished with slits, one of which is shewn in Figure 16, and which are slipped in by the sides of the other end plates. 20 Figure 17 is another view of the plate 16, shewn as removed from one side of Figure 7. Figure 18 is an end view of a similar plate, corresponding with Figure 9. Upon the main plate *b, b*, of this instrument a square border or frame *n, n*, is affixed, having dovetailed grooves formed upon each side of it, to receive the plate, Figure 19, which completes the wind chest, and this 25 plate, Figure 19, likewise contains the mouthpiece or opening *e*. A back plate or cover may also be fitted upon the outside of this instrument, to soften or improve the quality of its tones, if thought necessary. *f, f*, &c. are handles by which to support the instrument, and which may be doubled by making both faces of the instrument alike in form. 30

Another construction of an instrument of this kind is shewn in Figure 20, where the springs of the two rows *a, a*, &c. are placed in a reverse position to those of Figure 6, their loose ends being placed near to each other, and instead of the springs being exactly opposite to each other, as shewn in Figure 6, they are so placed as that the loose ends of the springs in the one 35 row are opposite to the spaces between the springs of the other row, and the pushing rods *m, m*, &c. are lengthened so as to reach across to the shorter ends of the keys, as shewn in Figures 21 and 22, and where they are united to them by joints in the manner already described.

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Its external appearance.—The form of its wind chest and the construction of the keys or valves are the same as in the instrument last described.

I shall next proceed to describe the modes in which semitones may be introduced into these instruments, when necessary. When it is only required to
5 introduce one or two, I employ the method represented in Figure 23, which is a sliding rod or bar *o, o*, placed across the wind chest, in the manner shewn by dotted lines in Figure 20; it lying in gaps formed in the top and bottom sides of the instrument. Near the inner end of this bar a hook *P*, Figure 23, is made, which enters a hole made in a spring *q*, Figure 20, affixed within the
10 top of the instrument, and which spring is also shewn in Figure 24. The action of this spring is to thrust the bar downwards. The bar is likewise furnished with a tooth *r*, which when the bar is pressed upwards by the application of the thumb to the stud *s*, upon the external end of the rod, is pressed close to the side or edge of the tongue or spring it is intended to act upon, and alters its
15 vibrations so as to cause it to produce a note which is a semitone higher than its natural tone, and when the bar is released by the removal of the thumb the spring *q* thrusts it downwards again, and permits the tongue to vibrate its entire length, and regain its natural tone. When another semitone is required to be introduced, of course another bar or rod similar to that above described
20 is to be employed. When, however, a greater number of semitones are to be introduced, I can employ the arrangement of keys represented in Figure 25, which exhibits the right-hand side of the instrument, and which instrument is composed of two instruments nearly similar in their mechanical details to that shewn in Figure 1, placed end to end, and their wind chests made to
25 communicate. There are consequently four parallel rows of finger studs on each side of the instrument. The two inner or middle rows of studs govern the notes of a diatonic scale in the order and arrangement before described in the references to Figure 1, but the key of E flat is here represented instead of the key of C, and the two additional or outer row of studs govern
30 notes which are respectively a semitone sharper than those governed by the adjacent studs below them in the inner rows. The scale governed by the studs of the two inner rows is played by the two first fingers of both hands exactly as on the diatonic instruments above described, and when the semitones are required the fingers are stretched sideways so as to reach the studs
35 governing them. I can also employ another mode of introducing the additional semitones, which is by combining two instruments in one, either such as is shewn in Figure 7 or in Figure 21. In the present instance two such instruments are combined by uniting their wind chests, the one being fitted to the other by dovetailed slides, and as shewn in Figures 26 and 27,

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the former being an external view of them as fitted together, and the latter a section only partly fitted together, in order to shew the manner in which the air is conveyed from the mouth-piece *c* over the top of the instrument and into the wind chest *n, n*. The arrangement of the studs and the notes of the scale with which they correspond are the same as described in the references 5 to Figure 25. I can also make a chromatic instrument, in which, instead of extra studs being provided for the semitones, a peculiar movement, to be shortly described, transfers the actions of pushing rods from one key to another, the one key corresponding with a note of a diatonic scale, and the other key with 10 a semitone above it. In Figure 28 the pushing rod *m* is shewn as having affixed upon it two wings or webs *t, t*, and which is shewn separately in Figure 31, the one wing being placed at an angle of about 90 degrees difference from the other wing, as shewn in the end view Figure 32. The two keys *c, c*, Figure 28, instead of having their shorter ends forked or cleft in the direction of the length of the keys, as in the former Figures, are here 15 shewn as being notched across; and when either of the webs or wings upon the pushing rods are turned down so as to enter the notch in the key, upon pushing the rod endways that key will be opened, as is shewn in one of the two uppermost keys in Figure 28. The pushing rod can be tuned by means of a small pin or lever *n* affixed in the stud, as shewn separately in Figures 20 32 and 33, and also in Figures 28, 29, and 31. In order to retain the pushing rods in either situation, a collet *v*, Figure 31, is affixed upon each, having two gaps or notches made in it to receive the nib of a spring *n*.

In Figure 30 several of these springs are shewn as entering the notches made in the collets, and retaining the pushing rods in the required situation. 25

Figure 29 shews the mode of arranging these compound keys. They are placed alternately in opposite directions, so that the finger studs are alternately on each side of the instrument.

Figures 28, 30, and 34 shew the manner in which two of the similar parts exhibited in Figure 29 are combined to form one complete instrument. In 30 this arrangement there are two wind chests *n, n*, as shewn in Figures 28 and 30, and which are connected together by the channel *x*, shewn in Figures 29, 30, and 34. The arrangement shewn in Figure 34, where the stud levers *u, u*, &c. are exhibited as turned downwards, represents the instrument as being in the key of E flat, and the semitones above are produced by changing 35 the situation of those levers or turning them upwards. Similar end plates to those already described in the reference to Figure 16 are also to be applied to the instrument last described, but having gaps or notches made in them similar to those shewn in Figure 35, where it corresponds with Figure 30.

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These plates likewise carry the springs *w, w*, shewn in Figure 30, upon the enner sides of them.

Figure 36 is an edge view of the plates united, corresponding with Figure 29, and these plates hold the two similar parts of the instrument to together.

5 Figure 37 exhibits an instrument known in China by the name of tsching or ching, and described in English books as the Chinese organ, but with improvements added by myself, as will be described hereafter. As, however, the construction of this instrument has not been well understood, so it will be necessary to give a short account of it. It consists of a number of pipes or
10 tubes inserted into a wind chest similar to that shown in Figure 37, but with a mouth-piece at one side instead of at the end of it, as here shewn at *e*. Each pipe is constructed in the following manner:—

Figure 38 is one of the pipes, having at its enner end, or that which is inserted into the wind chest, or tongue or spring resembling that of the
15 *Æolina*, before described, but with this difference, that in the tongue of the *Æolina* its free end must be slightly raised above the level of the aperture in the metal plate, to fit it for sounding, and it will only sound when the air enters the aperture from that side of the plate on which the spring is placed; whereas in the pipe of the Chinese organ the tubes so influence the action of
20 the tongue that it will not produce the required sound unless the loose end of it be depressed to the level of the aperture, and then its sound may be produced in whatever way the air passes through the aperture. The length of the tube is proportioned to the vibrations of the tongue, and near the tongue a small aperture is made in the tube, which, when open, prevents the pipe or tube
25 from sounding, but on closing it with the finger, and blowing into the pipe, the sound is produced. In Fig. 38 *y* is the tongue and *z* the aperture in the tube. Fig. 39 is an edge or side view of the lower part of this pipe. Fig. 40 is a view of the cover of the wind chest, with the pipes inserted into it in a circular manner. The pipes are placed in the same order as the springs or
30 tongues in Fig. 4, their lengths, therefore, decrease progressively from the bottom to the top. The apertures *z, z*, &c. are arranged in the same order as the studs in Fig. 1. This Figure shews the right-hand side of the instrument; but on the left side the pipes and apertures in them are arranged so as to correspond with the left side of Fig. 1. When semitones are required I
35 introduce additional pipes within the circular row of pipes above mentioned, as shewn in Fig. 40, and bring short tubes or pipes from the apertures *z, z*, in them, flush with the exterior surfaces of the other pipes, and as seen in Fig. 37.

Figs. 41 and 42 exhibit another form of the same instrument, differing from

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the former one in the pipes being arranged in two straight rows instead of a circular one only. My improvements in these two instruments consist in the application of the mode of fingering used in the preceding instruments, by the arrangement of the pipes and apertures in them.

Fig. 43 is a side view, and Fig. 44 an end view, of another instrument 5 similar to the two last described, but with the substitution of portable bellows for the wind chest. These bellows are constructed with several folds, and have no valve in them. As the wind is drawn inwards and expelled outwards through the apertures of the pipes in which the tongues are placed, the semi-tones may be added to this instrument in a similar manner to those last 10 described. I can likewise apply either of the instruments described in reference to Figs. 1, 2, 3, 4, and 25, to the portable bellows, an example of which is shewn in Fig. 45, where the ends of the bellows are formed of plates with rows of tongues or springs mounted in apertures in the manner before 15 described, and furnished with keys or valves with finger studs to them, as shewn at each end of the bellows in Fig. 45; or the other instruments described may likewise be fitted to the bellows under proper modifications of their structure. I do not mean or intend hereby to claim as my Invention 20 any of the various parts of which these said instruments may be composed which are already known or in use. But I do hereby claim the employment of two parallel rows of finger studs on each end or side of the instruments fitted with keys to terminate the ends of the levers of the keys, and the so placing them with respect to their distances and positions as that they may, singly, be progressively and alternately touched or pressed down by the first and second 25 fingers of each hand, without the fingers interfering with the adjacent studs, and yet be placed so near together as that any two adjacent studs may be simultaneously pressed down, when required, by the same finger, the peculiarity and novelty of this arrangement consisting in this, that as in the ordinary keyed 30 wind musical instruments the fingering is effected by the motion sideways of the hands and fingers, in this new arrangement that mode of fingering is rendered entirely inapplicable, and a motion which had not hitherto been employed is rendered available, namely, the ascending and descending motions of the fingers before described. This mode of arranging the studs enables me to bring the keys much nearer together than has hitherto been done in 35 any other instrument of a similar nature, and thereby to construct such instruments of greater portability. This arrangement of the finger studs being preserved, the methods of tuning the notes corresponding therewith may be varied in many ways; but the examples afforded in the references to the different Figures are those which I prefer. I likewise claim the introduc-

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tion of two additional rows of finger studs on each end or side of the instruments, parallel to those of the preceding arrangement, for the purpose of introducing the semitones, when required, as shewn in Figs. 25 and 26, and described in the references to those Figures. I also claim the compound
 5 pushing rod and keys represented in Figs. 28, 29, 30, and 34, and described in the references to those Figures, and whereby two different keys may be opened by the action of one finger stud. And I likewise claim the manner of altering the tones of the tongues or springs, by the application of a toothed bar to the edge of the tongue or spring requiring to be altered in its tone,
 10 and as shewn in Figs. 20, 23, and 24, and described in the references to those Figures. I also claim the arrangement of the finger holes of the pipes of the Chinese organ so as to make them correspond with the arrangements of the finger studs on the other instruments, and as shewn in Figs. 37, 42, and 44, and described in the references thereto, as well also as the manner of
 15 introducing the semitones into those instruments, as shewn and described.

In witness whereof, I, the said Charles Wheatstone, have hereunto set my hand and seal, this Nineteenth day of December, in the year of our Lord One thousand eight hundred and twenty-nine.

CHARLES (L.S.) WHEATSTONE.

20 AND BE IT REMEMBERED, that on the Nineteenth day of December, in the year of our Lord 1829, the aforesaid Charles Wheatstone came before our said Lord the King in His Chancery, and acknowledged the Specification aforesaid, and all and every thing therein contained and specified, in form above written. And also the Specification aforesaid was stamped according
 25 to the tenor of the Statute made for that purpose.

DOWNESWELL.

Inrolled the Nineteenth day of December, in the year of our Lord One thousand eight hundred and twenty-nine.

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MILKSTONE'S SPECIFICATION.

