



LVIII. On the recent improvements made in musical keyed instruments, with copies of the specifications of three patents lately granted for these purposes, to Mr. Hawkes, Mr. Loeschman, and Mr. Liston

Mr. Hawkes , Mr. Loeschman & Mr. Liston

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against the inside of the ribbed drum, or cylinder F, so as to open the ears and let out the corn, though the ears come in any position whatever. At H is a grating, upon which the beaters deliver the corn, chaff, and straw altogether; the two former fall through upon the ground at X, and the latter slides down on the grate; the corn is afterwards to be dressed in a winnowing machine, which separates the light and heavy corn from the chaff. The curbs F are fixed by screws, which can be adjusted so as to bring the cylinder nearer, or further from, the beaters, to adapt the machine for thrashing different kinds of grain; for it is evident that large corn, as peas, beans, &c. must require more space to rub them in than the smaller grain, as wheat and barley. L, fig. 1, is one of the uprights of the frame which supports the bearing for the axis B of the cog-wheel; and M is an oblique brace, which strengthens the frame. N is the stage on which the man who feeds the machine stands.

* * * This communication was accompanied with various certificates from most respectable individuals largely concerned in the agricultural line; all agreeing that Mr. Lee's thrashing mill is superior to any they had before seen.

LVIII. *On the recent Improvements made in musical keyed Instruments, with Copies of the Specifications of three Patents lately granted for these Purposes, to Mr. Hawkes, Mr. Loeschman, and Mr. Liston.*

THE interest which has been and seems further likely to be excited, by the recent improvements in musical Instruments, and the probability that now appears, of the mathematical theory of musical Intervals receiving a more direct and useful application to general practice, than has hitherto been the case, I am induced to lay before my readers copies of the specifications enrolled in the patent offices, by Mr. William Hawkes, Mr. David Loeschman, and the Rev. Henry Liston, for explaining their three several inventions; which being here brought together, the nature and peculiarities of each may the easier be understood by my readers, and their several merits appreciated. EDITOR.

Specification of the Patent granted to Mr. William Hawkes, of Newport, in the County of Salop, for Improvements on musical keyed Instruments with Twelve fixed Tones.—
Dated July 25, 1808.

To all to whom these presents shall come, &c.—Now
X 3 know

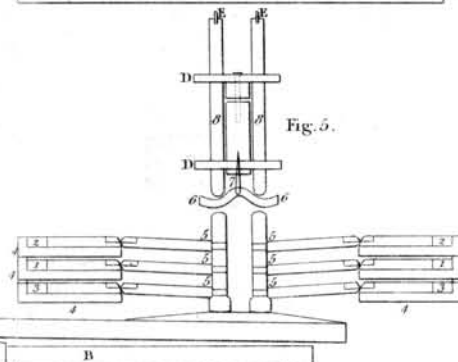
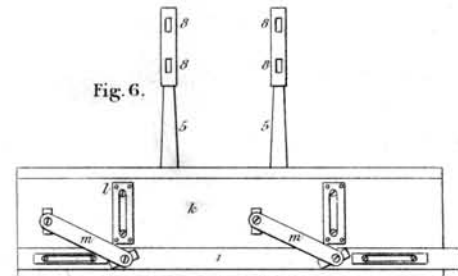
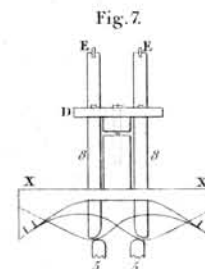
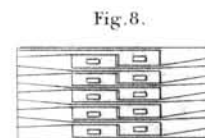
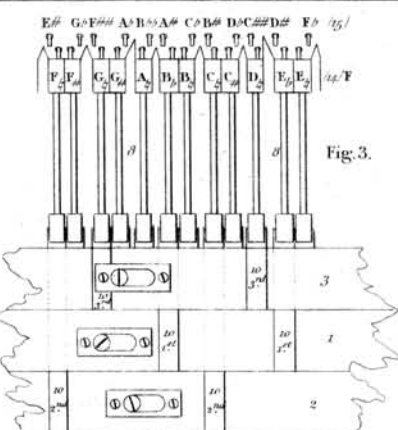
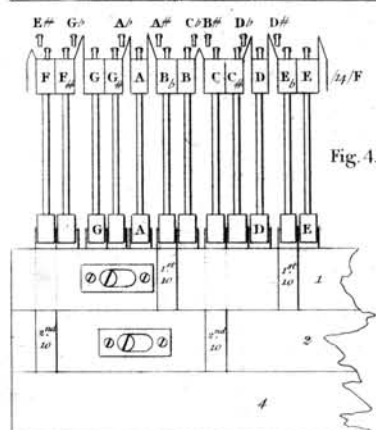
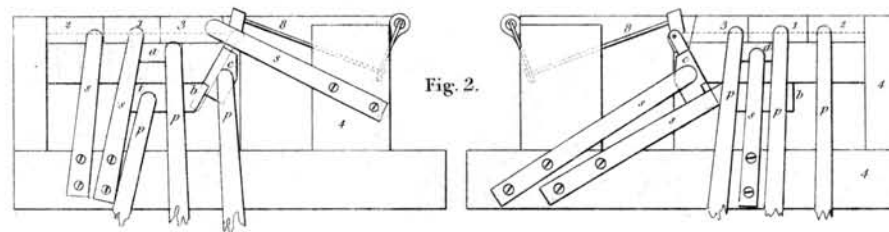
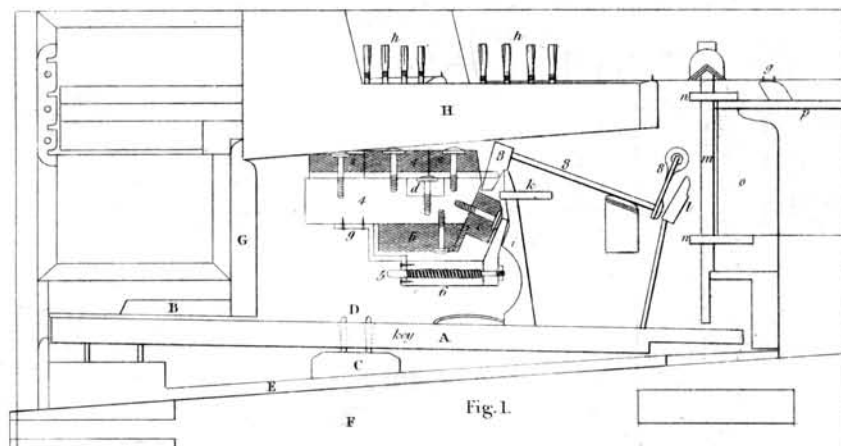
know ye, that in compliance with the said proviso, in the said letters patent contained, I the said William Hawkes do hereby declare, that my said improvements on musical keyed instruments of twelve fixed tones, are described as follows:—that is to say, The improvements in the organ are effected by a pedal under the key-board, and an extra slide to every stop in the sound-board, to correspond with the general slide. The above extra slide has a communication from the sound-board to the extra pipes; namely, sharps and flats; which by depressing the pedal with the foot, brings on the sharp scale, and by elevating the pedal brings on the flat scale; and as the flats go off the sharps are brought on; and inversely, as the sharps go off the flats are brought on; by which action of the pedal, communicated to the additional slide with double holes adapted to the additional pipes, namely, five pipes to each octave. My improvement in the piano-forte is effected, by adding seven diatonic and five flat tones to our present scale of twelve fixed tones, which form two chromatic scales; the one termed a flat scale, and the other a sharp scale, and is done by two sets of strings, of two unisons to each set, which are acted upon without the addition of a key to the key-board, by a pedal, by which the key-board is made to move forwards or backwards about one-fourth of an inch, the same hammer striking each set of strings both in the flat and sharp scale, by depressing the pedal with the foot, when the sharp scale is wanted, and elevating the pedal when the flat scale is wanted.—In witness whereof, &c.

Specification of the Patent granted to Mr. David Loeschman, of Neuman-street, in the Parish of St. Mary-le-bone, in the County of Middlesex, Piano-Forte Maker, for Improvements in the musical Scales of keyed Instruments with fixed Tones, such as Pianos, Organs, &c.—
Dated July 26, 1809.

To all to whom these presents shall come, &c.—Now know ye, that in compliance with the said proviso, I the said David Loeschman do hereby declare, that my said invention is described in and by the drawings (see Plate IX) and description thereof hereunto annexed, and in manner following; that is to say,—The scale of a piano-forte or organ on the common principle having 12 sounds within the octave, I have by my invention extended to 24 distinct sounds, which enables the performer to play in 33 perfect keys, 18 major (thirds) and 15 minor thirds; and this I have effected by means of six pedals, that cause the hammers

M^r Loeschman's Patent Piano Forte.

Phil. Mag., Vol. XXXVII, Pt. IX.



M^r Liston's Patent Enharmonic Organ.

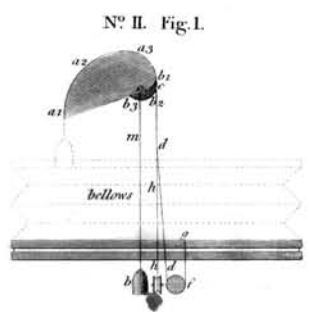


Fig. 2.

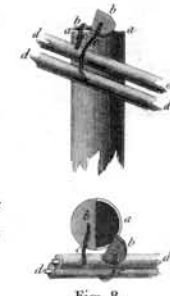
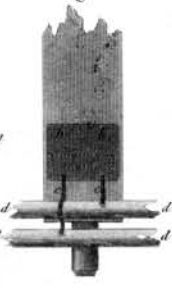
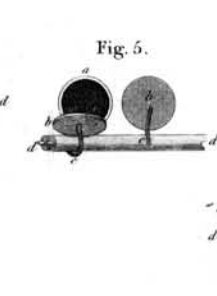
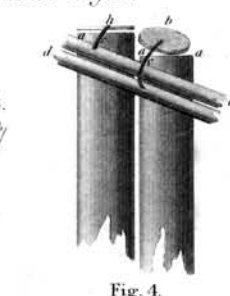
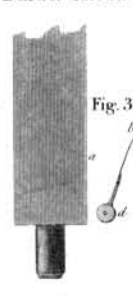
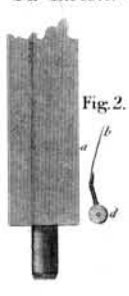
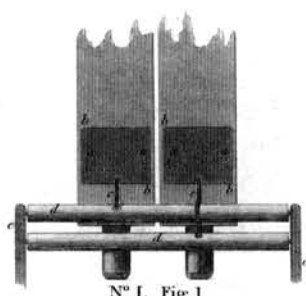


Fig. 8.

J. Farquhar delin.

S. Porter sculp.

mers to act upon 24 distinct sets of strings or unisons. Three pedals bring on the flats to be treble, and the like number bring on the sharps to the bass. By reversing my mechanism, I produce also the same effect; in which case, by three of the pedals the flats are brought on to the bass, and by the other three the sharps are brought on to the treble. Every pedal has a separate movement and spring, which act independent of the key; on each movement are fastened two of the twelve hammers belonging to each octave throughout the compass; so that a pedal for the flats brings on two additional flats in each octave, and in like manner a pedal for the sharps brings on in each octave two additional sharps; when such additional flats or sharps are no longer wanted, by omitting the use of the pedal the spring belonging to it immediately leaves the movement to its former position or fixed tones, of three sharps, two flats, and seven natural notes in each octave: the mechanism for the flats and sharps is so constructed, that if more sharps or flats are wanted than one pedal will produce, a second without the first, will be sufficient to bring on two of each in addition. So also, if more sharps or flats than the second pedal will produce are wanted, the third without the first or second, is sufficient to bring on two of each in like manner. Each pedal is made to fasten, if it should be wanted. In Organs, the improvement is effected also by six pedals; and in each octave there are 24 distinct sounds, from 24 distinct pipes: there is a separate movement and a spring to every pedal. Every fixed key has two stickers, two black-falts, and two pallets, which act on two pipes of different sounds. Three of the six movements are fixed in the middle of the front, above the keys, and bring on the sharps to the back of the organ, and the same number are fixed in the like direction behind, to bring on the flats towards the front. By fixing all the six movements in the middle of the front above the keys, or in the same situation behind, I produce also the effect desired. By reversing the movements, my mechanism will admit of bringing on the sharps and flats, either to the front or back of the organ, or, if wanted, my mechanism will admit having both the sharps and flats, either before or behind the instrument. With regard to the pedals and their construction, action, &c. I refer to that part (before described) relative to such, in my piano-forte specification.—In witness thereof, &c.

Specification of the Patent granted to Henry Liston, of Ecclesmacham, in the County of Linlithgow, Clerk, and Charles Broughton, of the City of Edinburgh, Writer to the Signet, for Improvements in the Construction of Organs.—Dated July 3, 1810.

To all men to whom these presents shall come, &c.—
Know ye, that in compliance with the said proviso, we the said Henry Liston and Charles Broughton do hereby declare, that our invention consists: *first*, in causing each organ-pipe to afford several tones differing from each other in acuteness or gravity, by applying to the mouth of a pipe or to the open end of an open pipe, one or more moveable shades, which are performed by means of a pedal or pedals, or by a stop or stops for the hand, or in any other way, may be enabled to remove from, or bring to the mouth or open end of the pipe at his pleasure. These shades are made of thin plates of lead or pipe-metal, such as is used in the manufacture of metal pipes (thicker or thinner according to the size of the shade) or of other convenient materials. The shades bear a different proportion to the mouths or open ends of the pipes to which they belong, according to the degree of alteration intended to be produced on the pitch of the pipes. When it is intended to alter the pitch of a pipe, by what is called the enharmonic fourth of a tone or the diesis in a tempered system, then the shade is of such size, as to cover the whole length of the mouth (across the pipe) rising about as much above the upper-lip, or of such size as to cover the whole open end of the pipe, and one such shade only is applied to each pipe; or the pitch of an open pipe may be altered, the diesis, by means of one shade at the mouth to alter it in part, and another shade at the open end, to alter the pitch as much more as requisite. This is chiefly useful, when, as sometimes happens, the pipe cannot well bear to be altered the whole diesis at the mouth or open end, or in the case of open wooden pipes, which are tuned by means of a fixed shade at the open end. When it is intended that each shade should alter the pitch by what is called comma, being the difference between the major and minor tones in a system of perfect intonation, then there may be two shades to the mouth or open end of each pipe, and the one shade is made to cover a little more than the half of the mouth across the pipe, but rising as much as the formerly described shade above the upper-lip, or a little more than the half

half of the open end of the pipe; and the second shade is made to cover the remainder of the mouth or open end: or in the case of an open pipe, one shade may be applied to the mouth to alter its pitch comma, and another shade may be applied to the open end to alter it another comma. For the convenience of being removed from or brought to the pipe, the shades are fixed on rollers or cylinders of wood, or other proper materials moving on pivots. For the purpose of attaching the shades to the rollers, each shade may be soldered to a piece of tinned wire, or brass-wire; which piece of wire may be screwed into the roller, or the shade may be attached to the roller in any other convenient way. When two shades are applied to the mouth or open end of one pipe, or when in a range of pipes the shades of some are upon different rollers from those of others, then the rollers may be arranged one above another; the wire or stalk by which the shade is attached on the lower roller, bending round the other roller or rollers, so as to apply the shade close enough to the mouth or open end of the pipe to which it belongs; or when convenient, one or more rollers may be placed on one side, and the others on the other side of a range of pipes.

This description is illustrated in the following figures: (see Plate IX.) No. I. figure 1, shows two pipes shaded at the mouth, each with the single shade, to alter the pitch by diesis: *a, a, a, a*, the mouths of the pipes; *b, b, b, b*, the shades represented transparent, that the mouths may be seen; *c, c*, the wire or sticks by which the shades are attached to the rollers *d d*; the stalk attached to the lower roller, bending round the roller above it; *e, e*, supports for the pivots of the rollers, one at each end of the range of pipes.

Fig. 2 and 3 are side-views of a pipe shaded at the mouth, to show the positions of the shades when close applied, and when removed; the reference being the same as in fig. 1.

Fig. 4, shows two pipes shaded at the open end; *a, a, a, a*, the open ends; *b, b*, the shades; *c, c*, the stalks which attach the shades to the rollers *d, d*; which are represented sloping, to correspond with the tops of the pipes. The shade attached to the upper roller is represented as close applied to the open end of the pipe, and that on the lower roller as removed from the pipe, to which it belongs.

Fig. 5, is a bird's-eye view of the same.

Fig. 6, is a pipe having two shades at the mouth, each to alter the pitch comma.

Fig.

Fig. 7, is a pipe with two shades at the top or open end, the one being close applied, and the other removed.

Fig. 8, is a bird's-eye view of the same. The references in these figures will be understood, from what has been already said. The use of these moveable shades is, that by means of them organs can be constructed with more complete scales than those in ordinary use, without so great a multiplication of pipes, as without this invention would be necessary. And whereas, from the ordinary construction of the bellows, those at least which rise on four ribs of equal breadth at each side, and each end, they do not blow with an uniform force, but with less force when full, and with a continually increasing force as the top sinks, and *vice versâ*.

We, the said Henry Liston and Charles Broughton, declare, that our invention consists, *secondly*, in a regulator which renders the blast of the bellows perfectly equable. This regulator is shown, No. II. fig. 1. it consists of a spiral piece of wood (or other proper material) *a, 1, 2, 3*, of about half an inch in thickness, more or less according to the size of the machine, and of a pulley *b, 1, 2, 3*, of similar thickness fastened to the spiral. This machine turns on a pin at the common centre of the spiral and pulley *C*. The string *d, d, d*, is fastened to the pulley *b, 1, 2, 3*, at *c*, and being wound round it, passes under a small pulley at *f*, and is fastened to the top-board of the bellows at *g*, at about an equal distance from either end. Another string *h, h*, fastened to the string *d, d, d*, passes under a pulley at *i*, goes under the bellows, and a similar pulley on the other side, and is fastened to the opposite side of the top-board; that when these strings act on it, they may pull both sides equally. These three small pulleys may run in one piece of wood, as shown, fig. 2, which being placed under the bellows, may be fastened to the frame of the organ; the weight or counterpoise *l* is suspended by a string *m*, at the centre of the spiral, when the bellows are quite empty. When, therefore, the bellows begin to rise, the strings *d, d, d, h, h*, are drawn so as to turn the pulley, and consequently the spiral in the direction *b, 1, 2, 3*, and then the string *m* is taken upon the edge of the spiral which is grooved to receive it: thus as the bellows are gradually losing force, the counterpoise *l* is gradually gaining power, by the increasing radius of the spiral on which it acts. If the bellows rise so much as to cause the pulley and spiral to make an entire revolution, the weight *l* will be in the
position

position λ , acting on the extremity of the spiral; and as the bellows sink, the spiral turning in the opposite direction, will gradually unwind the string so that the counterpoise will act on a radius continually decreasing, as the force of the bellows is increasing: the accuracy with which the regulator will equalize the force of the blast, depends on three circumstances; First, the form of the spiral, the size of the pulley b , 1, 2, 3, and the weight of the counterpoise l : the spiral curve is to be formed by the following rule: Describe a circle of any convenient diameter, and supposing the whole circumference to represent the size of the greatest angle which the ribs of the bellows make with the bottom- or top-boards. Assume any point, and from thence divide the circumference into segments (always measured from the same point) respectively proportional to the sines of the angles up to that greatest angle. It will be sufficiently accurate to take the sines of the five first degrees, thence the sines of each half degree up to 15° , and thence to the greatest angle (the entire revolution) each quarter degree, draw radii to all these points. Then from the centre of the circle, measure off each radius proportionally to the secant of its respective angle: and from this point draw a perpendicular to the radius; these perpendiculars by their mutual intersections, will form an irregular polygon, approaching to the curve required. The scale of equal parts by which the radii are measured proportionally off, to the secant of the angles, will be greater or smaller, according to the size of the bellows to be regulated. For a chamber organ of four or five stops, the secant of the greatest angle may be about ten inches: for large bellows it may be considerably larger; otherwise the weight or counterpoise might be inconveniently great: the size of the pulley is to be such that its circumference shall be exactly equal to the rise of the bellows, when the ribs make with the bottom- or top-boards, the greatest angle for which the spiral is made: the size of the pulley will therefore, *cæteris paribus*, depend on the breadth of the ribs—Thus, if the breadth of the rib be five inches, the circumference of the pulley should be equal to twice the size of the greatest angle, as put down in the ordinary table of sines, tangents, &c. calling the first figure in the table, inches, and the rest, decimals of an inch. If the ribs be less or more than five inches, the circumference of the pulley will be found from the tabular sine by a statement in the Rule of Three. First, as five is to the tabular of sine, so is the rib to a fourth proportional; which being doubled, is the circumference required.

quired. The weight of the counterpoise will be most easily found by experiment. If it be too little, it will correct the evil in part but not entirely; the bellows will therefore still gain some force as they fall. If again the counterpoise be too great, the bellows will have most force when full, and will gradually lose force as they fall.—In testimony whereof, &c.

LIX. Method of producing Heat, Light, and various useful Articles, from Pit-Coal. By Mr. B. Cook, of Birmingham.*

SIR, HAVING paid much attention to the procuring of gas and other products from pit-coal, I now beg leave to lay before the Society for the Encouragement of Arts, &c. the results of some of my experiments on pit-coal, and the methods of procuring the sundry articles of which I have sent samples, and a japanned waiter varnished therewith. The quantity of clear tar which may be produced from every hundred weight of coal is about four pounds, from which a liquor, or volatile oil, may be distilled, which answers the purposes of oil of turpentine in japanning. Every gallon of tar will produce nearly two quarts of this oil by distillation, and a residuum will be left nearly, if not quite equal, to the best asphaltum. I have sent a waiter, or hand-board, japanned with varnish made from this residuum, and the volatile oil above mentioned. This dries sooner, and will be found to answer as well as the best oil of turpentine, a circumstance which will be of immense advantage to this country, as in the vicinity of Birmingham only, nearly ten thousand tons of pit-coal are coked or charred per week; and all the tar hitherto been lost; but by my process, I dare venture to say, that from the various coal-works in this kingdom, more tar might be produced than would supply all our dock-yards, boat-builders, and other trades, with tar and pitch, besides furnishing a substitute for all the oil of turpentine and asphaltum used in the kingdom, and improving the coke so as to make iron with less charcoal.

I have sent a large specimen of the asphaltum, and three vial bottles containing as follows:

No. 1.—A sample of the oil or spirit, being part of that

* From *Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce*, for 1810.—The Society voted their silver medal to Mr. B. Cook for this invention.

which