

# Restoration Report for a 1784 Broadwood Square Piano, #229

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This report details the work done to restore a 1784 Broadwood square, the property of a Pianist in SC.

**Provenance:** The instrument was acquired in 1993 from a dealer who had himself acquired it at auction with the pianist in mind. The piano is serial number 229, and dated on the nameboard to 1784 in original calligraphy. The serial number and construction details are entirely consistent with the date. The pianist relayed that the instrument was quite dirty with residual strings and that he performed initial cleaning and removed the strings then in place. Nothing substantial was attempted until this examination.

**Condition:** The instrument was in fair condition with:

no strings present

bridge detached from the sound board but some form of alignment provided with wood blocks glued to the sound board (never used originally)

sound board in generally, to very poor, condition

action relatively free but all dampers heavily covered in verdigris, and the key levers sanded to clean them, avoiding the gauge and key lever numbers.

hammer touch cloth in generally better than usual condition

under hammer cloth worn and moth eaten

hammers in generally very good condition

two brass action stickers broken

many of the jack head (or old man's head) covers in poor condition, with three heads missing and/or inexpertly replaced.

all ivories present, though somewhat more worn than usual

all key fronts present

minimal wood worm damage to rear left case wall, stand, base boards

the case is intact on all sides and no detachment from the base found

no apparent shrinkage of the base boards.

General case has been refinished but no damage other than the usual wear and tear noted.

On original trestle stand, which has a pedal riser and pedal lever bracket still attached, but pedal itself is missing. The pedal actuated a lid flap through a sticker rod (nags head swell), with all but the pedal riser and stand attachment bracket now missing.

External dimensions: 1564 X 528 X 225 mm. Heads 39.5, sharps 80, Ebony height 10.7. FF = 1378 mm, dampers to e<sup>3</sup>

On careful removal and inspection of the sound board and loose bridge, it was evident that neither was original to the instrument. The sound board was loose on all but one part of the spine side, no hole was present for the lid flap sticker, on removal, bits of the original sound board were found underneath, some of the treble hitch pins had been driven into duplicate holes, and the mahogany edge molding entirely absent. The original ribs appear to have been reused and their placement corresponds closely with an original as documented<sup>1</sup> by Michael Cole. The bridge seems crudely made, and features 128 pins, 6 more than it should have, is truncated at the treble, and is some sort of reproduction or was retrieved from another instrument. The case bracing under the sound board is intact and firm, no separation found anywhere and generally in clean and neat condition. No distinguishing marks were found other than the conventional layout lines for cutting relief for the bracing.

Given that at least five other pianos from 1784 are known (SN 200 {Colt Collection.}, 204 and 206 {M. Cole}, 219 {A. Beurmann}, 283{?}) and at least two (204 and 206) completely restored by Michael Cole, and given the overall good condition of the case and action, a restoration was deemed advisable for this piano. With the sound board out, detailed dimensions could be taken for all the important features and a drawing made. A rubbing for a bridge from a 1787 instrument with the same dimensions as this one was available and a good bridge could be made from this, with features as found on instruments from this period. Placement of the bridge is also well documented, including the critical top f, c2, and lowest f distances, such that the bridge can be located to within a millimeter or so of its original location, well within the tolerance any of these had originally, or require to play well.

The usual set of dimensions will be given in the appendix along with the drawing of this instrument. In general, this is a 5 octave instrument, with a compass from FF to f3, a 3 octave span of 488 mm, and a nominal c2 scale of 300 mm, though this measurement is now precluded on this instrument due to the loss of the bridge.

## A Brief History



John Broadwood, from  
1784 miniature

John Broadwood made his first square piano between 1778 and 1780, with two extant 1780 pianos now in Canada and Switzerland. No piano dated earlier than 1780 has been found that presents as authentic. The first years of production saw a ramping up of numbers from six per year in 1780 to 100/yr by 1784 according to Michael Cole<sup>2</sup>. By 1793 production was several hundred pianos per year and grand pianos were being made along with the smaller squares. John's son James Broadwood would join as a builder in early 1794 and the name was then changed to Broadwood and Son. Broadwood was a Scotsman, brought up as a joiner, and had worked closely with Burkart Shudi from 1761. The spelling on the name board of this piano is a Latinized version then common among builders, but nearing the end of the style's period. It reads "Johannes Broadwood Londini Fecit 1784 *patent*/Great Pulteney Street Golden Square" or, John Broadwood made me in London 1784 & etc. The patent referred to is the patent of 1783 for the wrest pins relocated to the back of the instrument, underdampers, and some improvements involving a second sound board that were rarely used.

The inscription and style was commonly employed on instruments such as this piano and harpsichords, although the ornate calligraphy was giving way to a less severe approach among Broadwood's competitors, often with a simple enamel plaque surrounded by swags of inlay or painted decoration, and later, floral sprays. Broadwood continued with this more severe style far longer than others, although the calligraphic embellishments would be toned down slightly over the next decade. Once his son James joined the business in 1794, he dropped the Latinized version and stated simply John Broadwood and Son, with the date and the address. In 1808, the second of his three sons Thomas, would join and the name would again change to Broadwood and Sons.

From a construction point of view, Broadwood pianos were among the most well made, and while generally simple in decoration, the craftsmanship was superior to nearly everything else being made at

the time. Only Christopher Ganer and occasionally a few other builders could claim equal quality, and this has possibly resulted in quite a few Broadwoods still extant. Given M. Cole's number of 100 Broadwood square pianos being built in 1784 however, in general there are probably less than 10 still extant, and to date, six from that year are known to be in existence including this one, an unusually high survival rate. Many squares are not in museums or institutions, and are held in private collections or residences where listing instruments is unknown or not a priority.

Unlike most other squares at the time, Broadwood generally did not include hand stops on the instrument to let up the dampers or bring a strip of buff leather in light contact with the strings at the nut (buff stop), although he did include these items on request. All squares by Broadwood at the time this one was made would have been delivered sitting on a simple trestle stand, and later the 'French frame' with apron, a more elaborate style, and would have been sold as a 'square piano in the elegant style' intended for a higher end customer. These were popular with the merchant class and upwards at the time. A search by Michael Cole of the Broadwood Journal book does not show a listing of the sale date or owner of #229, but most were not listed at this early date.

The patent on the nameboard refers to Broadwood's patent of 1783, which placed the wrest pins at the back thus strengthening the spine and separating out the pins for supposedly easier tuning. This rarely proves the case in practice unless the square is against a wall, but the stronger spine was an improvement. As the tuning pins are at the rear, the conventional overdampener is not possible as there is no place to connect the levers. Broadwood makes use of a neighbor's invention (Froeschle) and employs brass underdampers, which are quite effective, though somewhat troublesome to service.

Broadwood was on a steady rise in business levels at this time in 1784 and would come to dominate the British piano trade in the 19<sup>th</sup> century, only beginning to fade by late in that century. Square pianos grew in size and volume and dominated the market until the introduction of a successful upright style in the 1820s. By 1850 the square was in sharp decline in Europe, while it was still reaching its zenith in America. The last square by Broadwood (and among the last in Europe) was made in 1866 (#66141) and sold two years later, with a destination in the tropics, as they could be specially designed for humid climates and were considered more robust. The company endured the 20<sup>th</sup> century with bumps and bruises, but as of this writing remains in business with a Broadwood on the board, under the banner of Finchcocks, and continues to make upright pianos for niche customers.

It had been thought until recently that numbering of pianos began with 200 in 1784 but a square of 1783 has been discovered with a SN 132 as reported by D. Hackett, so numbering began earlier than thought. As earlier instruments bear no number, the best assumption is that Broadwood counted up the approximate number of pianos they had built to date and began their numbering based on an assumed output. This would suggest numbering could not have begun earlier than mid 1783 to account for the numbers we see today. While this instrument may not be exactly the 229<sup>th</sup> square ever made to that date, it is in fact close to this. Given the tens of thousands of squares yet to come, this places this instrument at the dawn of the company's history.

(We are indebted to Michael Cole for supplying much of this history and for his pioneering work on Broadwood squares.)

## The Restoration:

All aspects of the instrument as presented were documented by photography and measurements where possible. Interesting, irregular, or confusing elements are given a more thorough treatment. This report serves as a summary of the findings, and a DVD of all photographs taken is attached, in the event that some additional element may need to be examined in detail at a later date. Photographs are generally made at highest resolution with a Nikon D90 SLR at 12 mega pixel, with close ups where appropriate. Construction of replacement elements are also documented and described.

As it arrived, we see the following:



The sound board presents with a complete separation at the midpoint, numerous cracks and splits, spills and general discoloration beyond what is usual for a sound board and with the bridge loose and detached. No holes for screwing the bridge to the sound board are present, and this is an early indication that neither this bridge nor soundboard were ever installed by Broadwood, who used two guide dowels and screws backed with beech blocks underneath to position and secure the bridge. The wood strip at left near the treble is also not original, being too short and with only 3 screws as opposed to an original 4 seen in sister instruments.



The plated brass sound board hitch pins were pulled, the sound board was soaked for several hours at the last point of attachment at the spine, and the glue loosened to allow it to be lifted out intact. Beneath we find the expected case bracing:



Residual glue from previous attempts to replace the sound board was removed from the fastening surfaces and the whole instrument photographed:



On removal of all glue, traces of the original Broadwood soundboard were found that match the quality of similar boards known to be in use, with ~18 growth rings per inch, and a clear coniferous wood that is similar to several species of spruce. The soundboard that was removed appears to be pine, with numerous knots and sap pockets, and is an inferior specimen of soundboard art. The bridge was found to have 128 pins inserted, but there are only 122 strings on this instrument. It is poorly crafted, and is unlikely to have dated from the 18<sup>th</sup> century, and is probably a 20<sup>th</sup> century piano technician's or home enthusiast's guess at a bridge, possibly having seen remnants of the original. It is not serviceable and must be remade.

Engelmann Spruce matches the cell structure in the original closely and was chosen to remake the soundboard. Segments from **Frasier Valley Fine Woods, BC, Canada** were obtained and the edges trued and glued together. The material was thinned by hand plane to approximately that reported by Michael Cole in instrument #206. The inside dimensions of the soundboard well were taken, as well as dimensions of all bracing and case structure, towards a complete mechanical documentation of the piano. A new sound board was made to these dimensions.

The ribs have the size, color, and craftsmanship of original ribs, and are almost certainly the original ribs for this instrument. Checking the placement of the ribs on the old soundboard against the placement recorded by Cole for his restoration of #206, we find that placement was very close, and the ribs were soaked away and returned in place to the new soundboard.

A bridge was needed, and a high quality beech board selected and purchased. We needed a pattern to make a new bridge by, and fortunately David Hackett is in possession of a 1787 Broadwood whose dimensions are identical to this date. A rubbing was obtained of the bridge pins for placement, and measurements made of the exact location of the bridge top treble and lowest bass pins with respect to the case walls, as well to the top treble nut pin (the scale) so a replacement bridge could be located exactly. David also provided the width and height of the bridge body at strategic locations as below:

Height (including STRING - i.e. knock off diameter)

Bass - 20.5

Top - 12.1

Mid - 17.0

Bottom is wider than this - about 5 degrees of tumble-home on both sides. Overall width and height are thus about equal.

Treble - 15.5

Width (measured at TOP of bridge)

Bass - 16.0

Top surface a very flat inverted V with a rounded peak, nearly central. About 1.5mm slope bass, 1mm or less treble. Pins about 25% from front face at bass - i.e. part way down the slope. Even closer to the edge at treble - barely a pin's width back.

Mid - 13.7

Tightest part of curve - 12.5

Top pin 69 from spine, 111 from top nut-pin (= scale).

Bottom pin 140 from end, 56 from front.



With this information, a new bridge was fabricated that closely matched the original, particularly with respect to the pin placement. The beech was set into the planer at an angle so that the taper in height from treble to bass was obtained. The tail was cut to a pattern seen on the Colt #200, and the treble was carved to match what was standard Broadwood practice at the time, though an error left the final angle of the treble finial short of parallel with the bridge body. As this makes no difference to the sound, it is noted only for correctness.





Bridge pins of brass were obtained from the "Instrument Workshop" from Lutz Bungart, the bridge drilled at the correct angle prior to shaping the sloping edges, and after bringing the bridge to the final shape the pins were inserted, held in a brass rod that was pre-drilled to a depth matching the desired final pin height. This way the pin is loaded and easily hammered in leaving each pin at the same height.

Once the bridge was located, an outline was made, guide holes drilled in the sound board for two dowels, the bridge returned to proper placement and drilled for the dowels, and dowels glued into the bridge. Now it can be located easily for the screws, and held in place without smearing glue for final attachment. Beech blocks were made and drilled and countersunk for the screws to pass, and the bridge glued and screwed to the new sound board with the beech blocks acting as support for the screw head. These blocks are also glued in as well.

In this design, the treble hitch pins extend at a 45 degree angle into the soundboard area, and are secured by a large beech member that also acts to strengthen the case as a strut. A tracing was made of the location of the hitchpins, the original holes separated from some duplicates made later, and this was set aside to assist in locating the new hitchpins once the sound board was replaced.

The completed sound board is then ready to install, but first, mahogany moldings needed to be made that form the perimeter of the sound board and help hold the edges in place. These were made to dimensions taken from Colt #200, though the front moldings were somewhat simplified since the tooling to make the more complex cove molding is not available. Decorative lines were scribed by hand tools, finish nail holes were drilled with placement aligned with the original nail holes found in the linings, and the molding finished in Danish oil.

On the first 'fine day' with humidity around 38% and temperature warm but moderate, the soundboard was glued in and moldings secured with headless brass nails. A beech strip that covers the soundboard edge under the strings on the far left had been fabricated and drilled earlier for screws that match the original 4 holes in the mouse hole lip, and this completes the soundboard installation. A tuning fork test gave a good response across the whole bridge.

The action was addressed next. The cloth under the key levers was badly worn and insect damaged, and paper spacers has been employed to give some sense of level to the keys. This was documented and saved for archiving, and a cloth obtained from Graham Walker in the UK, chosen for its close approximation to the original cloth, was installed cutting the rebates for sharps as was originally done.



An 18<sup>th</sup> century playing card was used as a shim for the bottom of the action. Possibly an early repair.





The hammer rail was carefully removed and the hammer hinges exposed, probably for the first time since the piano was made. The hinge condition is very good, and hinges will not be replaced unless failure begins to occur. With the rail off, it is possible to unscrew the two hand-cut brass nuts that hold the hammer rail in vertical and horizontal alignment, and with the screws at the ends also backed out, the rail was removed and carefully set aside. With the hammer rail free, it is possible to remove the



dampener rail and dampers, held at either end by screws and two additional hand-cut nuts, and a center screw.

The dampener rail was soaked for two hours without wetting the damping flannels, and the dampers were removed one at a time and inserted in order in a pre-drilled plank to hold them while cleaning.

Cleaning the dampers involved a 5 inch fine wire brass brush chucked in a drill press to remove surface and joint verdigris, a buff with an unloaded polishing cloth, followed by wetting the joint with the solvent "Goof-Off" which is a multi terpene mix, to remove gummed oil residue, and a light application of a high quality lubricating oil (Liquid Wrench L204). The joint was worked several times with both solvent and oil until the damper falls free over the whole range of travel. This step was repeated for each damper. The dampers were returned to the oak dampener rail but not glued until they can be aligned with the hammers and strings.





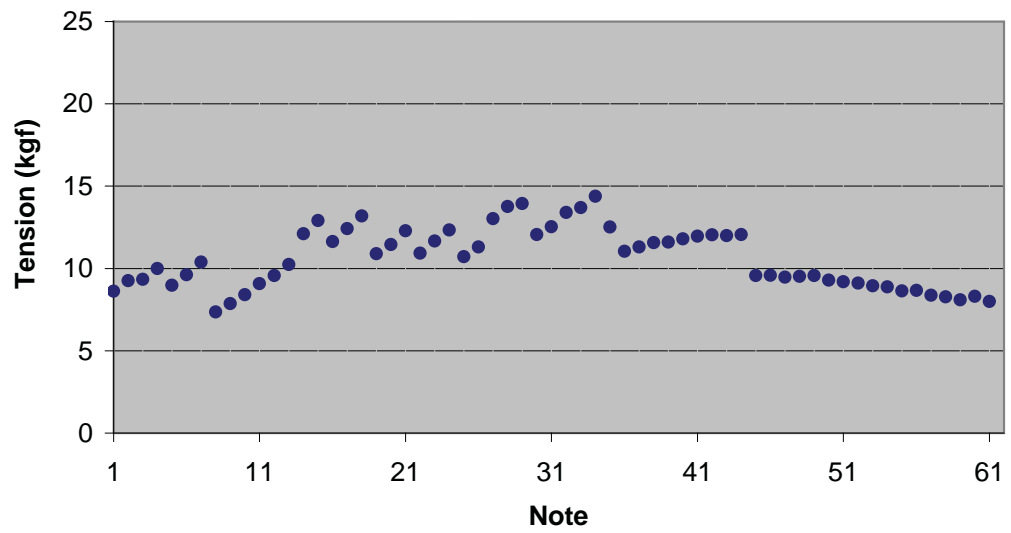
The red flannel cloth pieces from the hitch pin rail were cleaned in "Woolite", then dipped in a cold oxalic acid (at 1% concentration by weight) for 5 minutes to remove the iron stains, then blotted and dried on a towel. Hide glue was brushed on the wood surface around the pins and the cloth returned.



Stringing schedule for 1784 BW square

Note	Note #	Gauge #	Diameter (mm)	Overspun pitch, turn to turn (mm)	Length (mm)	Composition
FF	1		0.74/0.41	1.2	1377	Brass/tinned copper
FF#	2		0.74/0.41	1.2	1347	“
GG	3		0.71/0.41	1.3	1316	“
GG#	4		0.71/0.41	1.3	1285	“
AA	5		0.62/0.41	1.3	1256	“
AA#	6		0.62/0.41	1.3	1226	“
BB	7		0.62/0.41	1.5	1204	“
C	8		0.55/0.32	1.6	1169	“
C#	9		0.55/0.32	1.6	1142	“
D	10		0.55/0.32	1.6	1113	“
D#	11		0.55/0.32	1.8	1092	“
E	12		0.55/0.32	1.8	1058	“
F	13		0.55/0.32	1.8	1034	“
F#	14	14	0.74		1007	Yellow Brass
G	15	14	0.74		981	“
G#	16	13	0.68		957	“
A	17		0.68		932	“
A#	18	13	0.68		907	“
B	19	12	0.60		882	“
c	20		0.60		853	“
c#	21	12	0.60		834	“
d	22	11	0.55		811	“
d#	23		0.55		790	“
e	24	11	0.55		767	“
f	25	10	0.50		742	“
f#	26	10	0.50		720	“
g	27	11	0.55		695	Iron
g#	28		0.55		674	“
a	29	11	0.55		641	“
a#	30	10	0.50		619	“
b	31		0.50		595	“
c'	32		0.50		581	“
c#	33		0.50		554	“
d	34	10	0.50		536	“
d#	35	9	0.45		525	“
e	36		0.39		465	“
f	37		0.39		444	“
f#	38		0.45		424	“
g	39		0.45		401	“
g#	40		0.45		382	“
a	41		0.45		362	“
a#	42		0.45		343	“
b	43		0.45		323	“
c''	44	9	0.45		306	“
c#	45	8	0.40		289	“
d	46		0.40		274	“
d#	47		0.40		257	“
e	48		0.40		243	“
f	49		0.40		230	“
f#	50		0.40		214	“
g	51		0.40		201	“
g#	52		0.40		189	“
a	53		0.40		176	“
a#	54		0.40		166	“
b	55		0.40		154	“
c'''	56		0.40		146	“
c#	57		0.40		135	“
d	58		0.40		127	“
d#	59		0.40		119	“
e	60		0.40		113	“
f	61	8	0.40		105	“

## Tension calculator for John Broadwood 1784 square



All wire is from Malcolm Rose at the "Workshop English Passage", LEWES, BN7



## Nag's Head Swell Restoration:

Remains of a nag's head swell on the trestle stand would indicate that at least at some point in its history the piano was equipped with this feature, and probably before 1800. Removal of the support riser and attachment bracket shows the stand is apparently unfinished under those features, which strongly argues in favor of this being an original feature. At least two other 1784 Broadwood squares, Colt # 200 and Cole # 206 feature this device. Cole emailed that his #206 swell was probably installed later, perhaps in the 1790s. The one in the Colt collection is also incomplete but may be original. Broadwood did not often add stops and damper raising features, doing so mostly on request only, and squares from ten years later rarely show this device.

The chief use of this feature is to further control the dynamics of the instruments. With the lid flap closed, the player can slowly or suddenly increase the volume by pressing on a pedal that actuates a wood or iron bar to push on a wooden or brass riser rod, which lifts the lid flap to the far right of the instrument. A rebate cut in the lid is lined with red flannel cloth and serves to soften the lid closing so a noiseless closing is effected.

To accomplish this, an iron bar 1/8" thick X 1" X ~ 2.5' was heated and twisted to create a flat for attachment to the angled trestle stand bracket, and drilled for a leather strip at the pedal end, and a leather pad at the bass.





A 1/8" iron rod was forged with a Sheppard's crook at one end and an 'L' at the other of such length to easily allow the pedal to move over a comfortable range. At the right inside cheek, a brass rod is used to actuate the flap, with a sole leather tip and spacer washer to keep it in alignment. The rod is just long enough to reach from the leather pad to the lid flap with the pedal fully up, and the flap closed.

The pedal was made of mahogany from a pattern in the Colt Collection, and attached as originally suggested by the remaining hinge flap fragment. The size of the pedal was approximated closely by the measure of a 'foot' as shown (note: my foot is very close to 12 inches).





### **Final Assembly:**

Overspun strings were made to the correct diameter and pitch as reported by Cole and also found in the "Handbook of Historical Stringing Practice", David Law and Malcolm Rose, and installed. With all the strings in place, the dampers were glued in with a room temperature hide glue formula that allows ample time to adjust the dampers to the correct string pair. The damper rail was reinstalled, followed by the hammer rail and cover, and the entire action reinstalled into the piano. A strip of wood that covers the keybed in front was made of mahogany and given the proper rabbeting and taper, and installed in the front of the action, locking it in place. The lid hinges were all checked, and the lock removed, cleaned and two centuries of rubbish removed, and then oiled. A key was chosen from a contemporary junk key and drilled and cut to fit the lock. The lock now actuates freely.

Tuning the instrument involves stretching the strings and tensioning the case, probably for the first time in several decades. The piano is tuned to A415, and will service nicely at that pitch. These can, and have, been tuned to A440, but the extra tension has destroyed the mechanical integrity of more than one instrument! It was originally tuned to something like A 425 or 430 if evidence of tuning forks from the

late 18<sup>th</sup> century can be believed, but my opinion is that if the player can tolerate A 415, the instrument will sound no brighter or more pleasing tuned higher, but the mechanical stress will take a toll that won't be seen at the ½ step lower pitch. Things are not what they used to be, tune this piano to A 415.

### **Care of the Instrument:**

The enemy of early pianos is low humidity, very high humidity, and rapid changes in between, which exercise the wood and loosen joints. Dust and dirt are to be avoided, but it can tolerate much of both without compromise. Low humidity is especially to be avoided, and put directly over a heat vent in a central air heated house, it can develop fatal problems in a single winter. A constant humidity of between 40 and 55% rH is desirable and preferred.

The new soundboard, under stress and low humidity, may develop a crack in time. This is by no means a fatal occurrence, and most originals are found with one or two cracks. If the crack develops such that strings are displaced or the bridge becomes loose, some remedy would need to be pursued. This is a highly unlikely event if only the humidity is kept close to nominal.

The dust board is there because it was installed originally, and serves to limit damper noise and keep dust at bay. It can be removed at will for playing, showing or otherwise, but it won't hurt things to put it back when finished.

Tuning should be approached a note at a time; a continuous mute cloth is unlikely to fit between the strings, and pushing them strongly to the side is not advised. Spares are included and should a string break, a new one can be put on. The method of hand wrapping is straightforward, as below:

Holding the pin in the left hand, the string already on the hitch pin, and the end of the string in the right hand, hold the string end and bottom of pin together, and turning clockwise, make a loose spiral of the wire around the pin up to the flat part of the pin. Continue one turn around the flat and spiral to the middle, then close turns around the wire and pin three or four times. Holding everything under the tension of the wire, grab the bit of wire hanging out from below the turns and crank it until it breaks off. Then continue tight turns on the pin until you are over the hole for pin looking straight down. Keeping things under tension, insert the bottom of the pin in the hole and push in, with a slight twist from the tuning wrench to ensure tension. Hammer the pin in until it bottoms out or approaches its neighbors height. Get the wire on the right bridge and nut pin, then bring up to tension. If you slipped and the wire is loose on the pin but still in some contact with the pin, and drop of super glue (cyanoacrylate) will cinch it to the pin and you don't have to start over.











Appendix:

SN 200 from Colt Clavier Collection





SN 206 Michael Cole







SN 219 from Dr. Andreas Beurmann

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<sup>1</sup> Michael Cole, *Broadwood Square Pianos; Their Historical Context and Technical Development* (Cheltenham: Tatchley, 2005) pg 121

<sup>2</sup> Michael Cole, *Broadwood Square Pianos; Their Historical Context and Technical Development* (Cheltenham: Tatchley, 2005) pg. 56