1.09 A South Australian reed and pipe hoard.

Craig Fischer.

I started to develop a strong passion for the Union pipes in about 1979. I had been making my first Irish chanters and was struggling to make reeds and all the other bits and pieces necessary to get a practice set working. At that time, I had the good fortune to make the acquaintance of the late Desmond O'Leary, a man whose grandfather had been a correspondent of the American collector and writer Francis O'Neill.

Over time Des had inherited an assortment of musical bits and pieces from his family amongst which were a ragtag assortment of Brian Boru pipes, bits of Union pipes, and other paraphernalia which he had stored in his garage in cardboard cartons. He allowed me to examine this precious debris and topped it off by giving me what turned out to be the body of a set of Irish pipes, two old bellows, and some old reeds plus sundry items.

There is a lovely anecdote on page 379 of O'Neill's *Irish Minstrels and Musicians* [1] in reference to Patrick O'Leary of South Australia, in which O'Neill relates the acquisition of a set of pipes.

> Many years ago Mr O'Leary endeavoured to obtain a set of Union pipes-the perfected Irish instrument-from an aged piper named Kelly who used to wander about the country, but his efforts were unsuccessful, as the old minstrel had disappeared and finally died in some institution. At one of the meetings of the Band Committee an old man strolled into the room carrying an old faded and worn bag under his arm and sat beside Mr. O'Leary. "What have I in the bag, eh? Wisha sure 'tis only an ould set of Union pipes."

These were Kelly's pipes and O'Leary bought them for ten shillings. O'Neill goes on to describe how the pipes were put in order by a visiting Northumbrian piper.

The body of Kelly's pipes turned out to be the one which I had been given and it still had a Northumbrian pipe bag tied onto it. It was well worn from playing, almost played out. Des called it "that old yellow set" and to his recollection it had last been played in about 1940 by his Uncle Eugene. It is a boxwood, ivory and brass set with two regulators and three drones all in a solid boxwood stock, made by Crotty of whom little is known, and pitched at about 30 cents flat of modern D. The chanter is now missing. The baritone regulator is 377mm in length. Not only is this a rare make but also an unusual pitch to find in Union pipes. It is more common both in earlier sets and in its Pastoral pipe equivalent, C.

One thing which is rarer to find intact than an old chanter is an old reed to go in it. Reeds are comparatively fragile and more disposable than a set of pipes, but luckily, amongst the bits and pieces I had, were many old reeds. At various times, in addition to this set of pipes, the O'Leary family had owned pipes by the Taylors and another set in the same pitch as the Crotty set but by a different maker, Coyne. The chanter of the Crotty set had been given away with the body of the Coyne set and the Coyne chanter was subsequently separated from even the Crotty body.

Reeds to suit all of these pipes are amongst those I have, some of them now damaged but obviously well made. Some of them still make a sound and one of them still works

[1] *Irish Minstrels and Musicians*, Captain Francis O'Neill, Chicago 1912.

very well. It is hard to judge the age of a reed but I have some evidence for the antiquity of this one working reed and the others like it. As mentioned, the pipes were last played about fifty years ago and this is the youngest the reeds could be. Judging by the condition of the materials in them, their colour and surfaces, they appear to be much older than that.

When I recently had a chance to examine the Coyne chanter I found that the one working reed was almost certainly the one which belonged with that chanter. The reed seat in the top of the chanter was aligned at an angle to its main axis and this reed had a small bend in the base of the staple which allowed it to fit in that chanter perfectly true one way around, and so much out of true the other that it wouldn't fit inside the reed cap. I believe this Coyne chanter originally belonged to another local piper by the name of Critchley, also mentioned by O'Neill.

In Ireland I had the opportunity to examine another old reed which was almost certainly made by one of the Coynes and still in the pipes to which it belonged. With great excitement, holding my reed next to this one, they looked like the work of the same person. They had the same thread and winding style, the same type of cane, the same type of wax and the same style of scrape. More than that, it will never be possible to say. The reeds I have are all old, many are evidently professionally made and they are the nearest we will likely ever get to those made in the 19th century.

It's worth mentioning that the best reed works not only in chanters at this pitch but in many others pitched from D down to B. It is some sort of magic reed. It seems most suitable for chanters by the Kennas and Coynes. In modern times we have grown used to the sight of the rather oversized reeds made for wide bore concert pitch chanters and, to many, the sight of these small reeds comes as a surprise. I think it is not uncommon for modern reed makers to make reeds for the older type of instruments with the larger and stronger reeds in mind. The evidence of these O'Leary reeds and other surviving old reeds suggests that this was not the common practice of the 19th century.

The reeds in detail.

There are three types of reeds shown here in a series of photographs. The first are around 72mm long and 9mm to 10mm wide at the tip. Their staple exit bores cluster in the vicinity of 3.2mm. The second type are possibly Taylor reeds, notably #8 and #10 with staple bores near 3.6mm, and the third type are bass regulator reeds. Some of those of the first type were most likely fitted to either tenor or baritone regulators.

In order to present the measurements of these reeds and reed parts as compactly as possible I have identified them with numbers and summarised them in Table 1. The key to the reed parts measured in Table 1 is given in Fig 7.

Brief descriptions of the reeds.

Reed 1 and 2. Working reeds for the Coyne chanter. Left and right in Fig. 1 respectively.
Reed 3, Fig. 2. Similar to #1 and #2, dismantled.
Reeds 4 and 5, Fig. 3. Similar to #1 and #2.
Reed 6. A dismantled reed of the same type. Only the staple of this one is shown in Fig. 9.
Reed 7. Measured but not shown. This reed is now in the possession of Geoff Wooff.
Reeds 8, 9, 10, Fig 4. Larger reeds. Most likely for the Taylor chanter
Reed 11, 12, Fig. 5. #12 (upper picture) is a bass regulator reed which would suit the Coyne set.
Reed 13,14,15, Fig. 6. Large bass regulator reeds. Likely Taylor reeds.
Reed 16. Only a loose blade and not photographed, very similar in size to reed #1.

Fig. 1

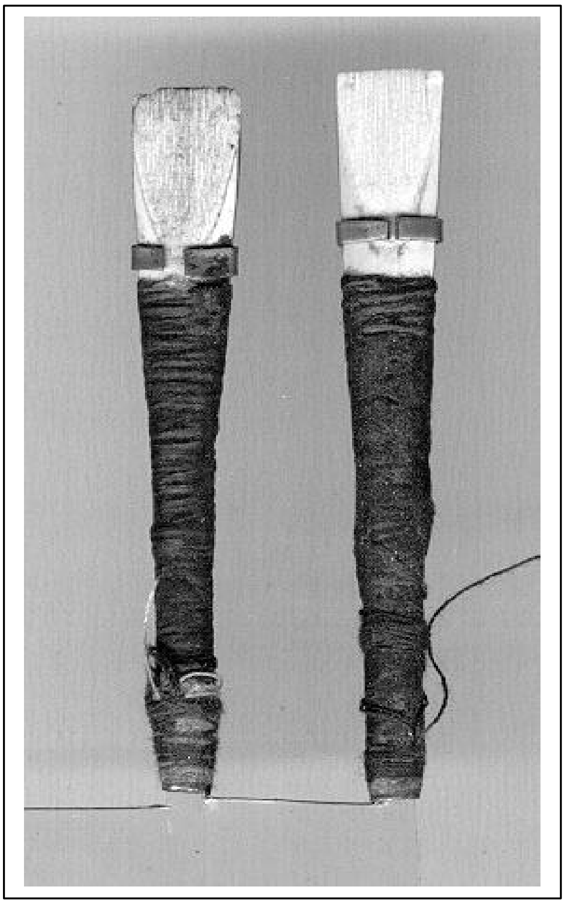


Fig. 2

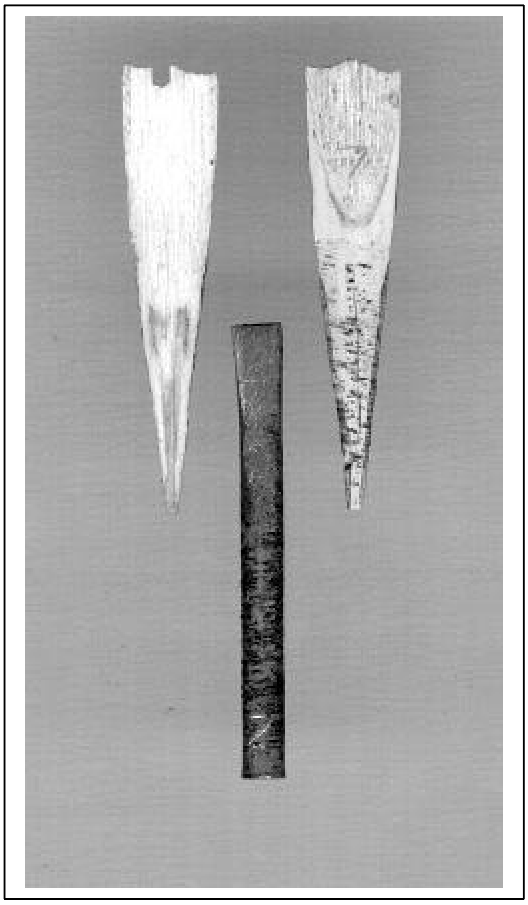


Fig. 3

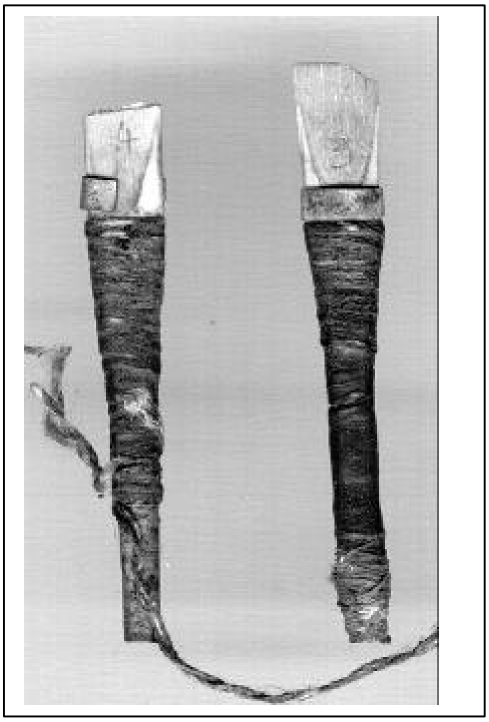


Fig. 4

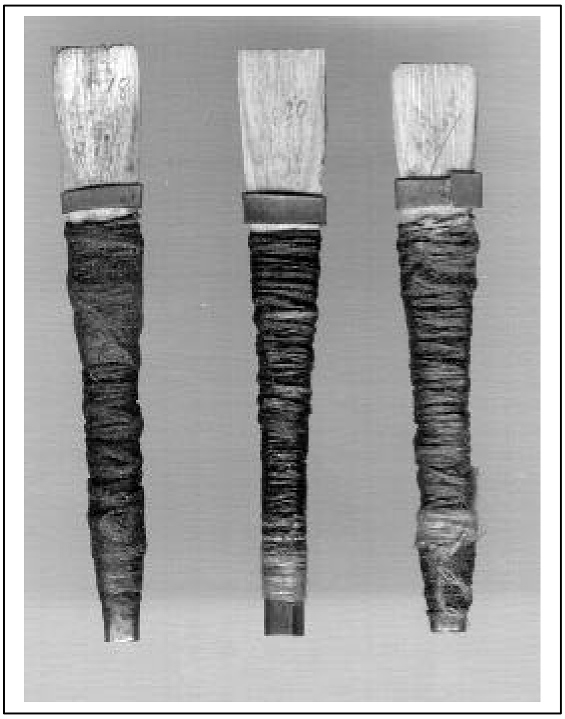


Fig. 5

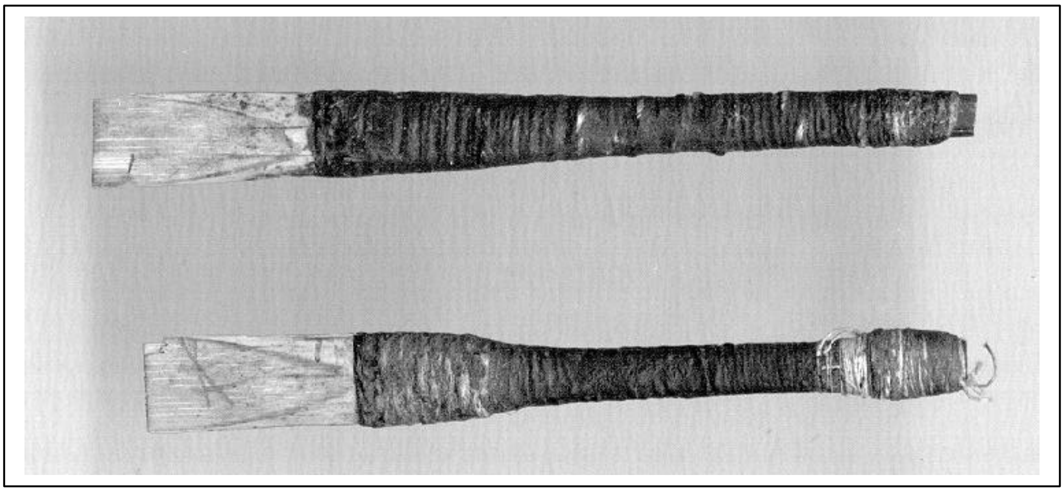


Fig. 6

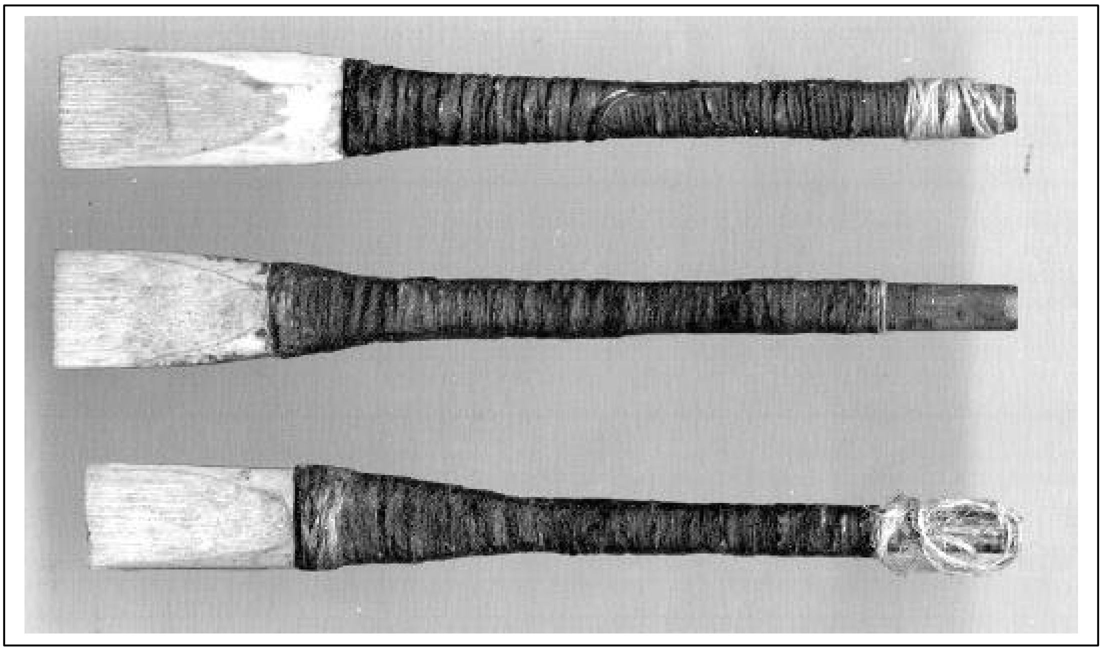
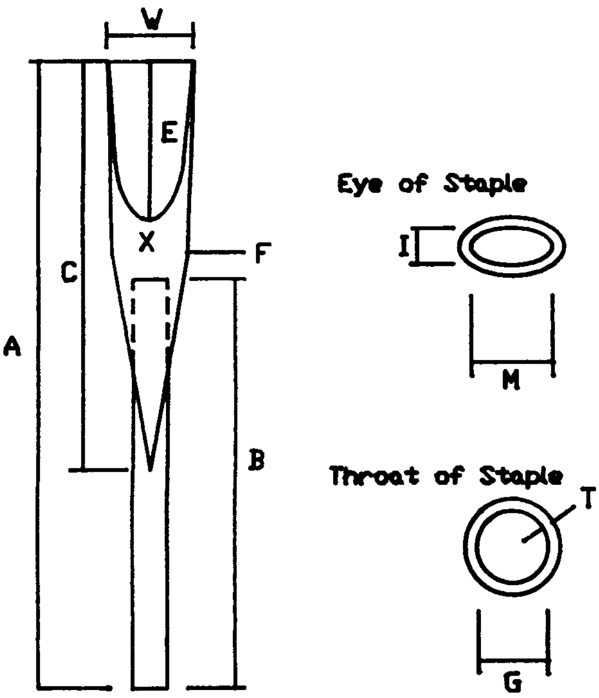


Fig. 7a.



A	Total Length
B	Staple Length
C	Cane Length
W	Tip Width
E	Scrape Length
F	Width of Cane Near Bridle
G	Staple Throat I.D
M	Staple Eye Maximum ID
I	Staple Eye Minimum ID
T	Staple sheet thickness
X1	Unscraped Cane Thickness
X2	Head Thickness at Bridle

Fig. 7b. **Key to reed measurements.**

REED #	A	B	C	W	E	F	G	M	I	T	X1	X2
1	71.2	46	46.5	10.1	18.1	8.25	3.3	-	-	.56	-	4.1
2	73.3	46.5	48	10.1	19	8.6	3.1	-	-	.56	-	3.7
3	71	46.3	46	-	-	8.3	3.1	3.9	1.3	.56	-	3.44
4	-	47	-	9	-	8.6	3.25	-	-	.36	1.03	3.5
5	73	47	44	9.1	16.5	8.3	3.27	-	-	.41	-	3.8
6	-	47	51	10.2	20	8.8	3.35	-	-	.56	-	-
7	-	46	50	9.7	-	8	3.17	4.12	1.34	.56	-	-
8	76	48	49	11.4	20	9.2	3.76	-	-	.46	-	5.13
9	75	50	49	11.4	21	8.8	4.15	-	-	.47	-	4.3
10	72.63	49	46	11.3	19	9.15	3.6	-	-	.56	-	3.64
11	76	48	48	9.2	18.5	8.44	3.15	-	-	.47	-	3.6
12	82	54	38	9.1	18.5	8.1	3.14	-	-	.47	-	4.53
13	100	68	59	11.5	23	10.8	3.6	-	-	.43	-	45
14	105	77	62	13.2	23	10.2	3.6	-	-	.51	-	5.4
15	103	70	-	13.1	23	10.8	3.9	-	-	.47	-	4.4
16	-	-	50	10.1	-	8.5	-	-	-	-	.89	-

Staples.

Fig. 8.

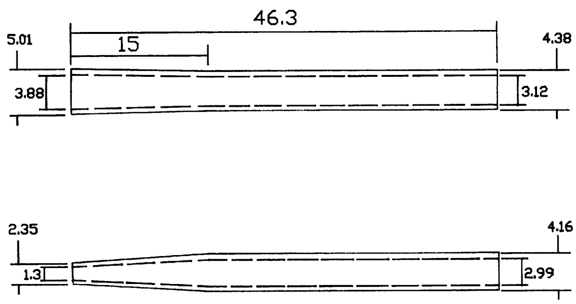


Fig. 9.

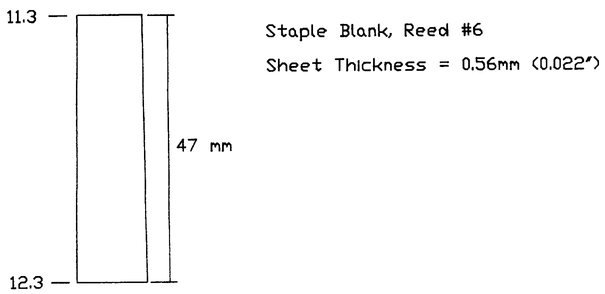
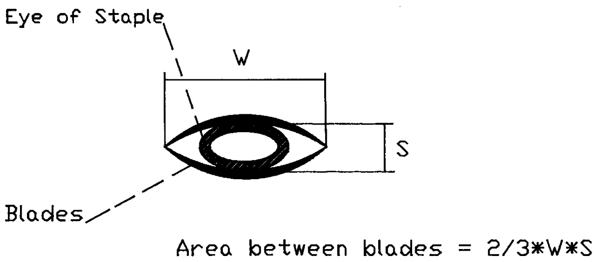


Fig. 8 left, is a dimensioned sketch of the staple of reed #3. Since it is not possible to measure the staple sizes adequately with an intact reed, and this one was damaged, I carefully dismantled it. All the staples are made from thin metal sheet which has been cut and rolled to shape. Reed #6 was one which was already in pieces. To find out what size of metal blank was used to make this staple, I carefully annealed it and unrolled it, gently smoothing out the fine wrinkles due to the rolling process. It is a simple straight sided blank whose dimensions are given in Fig. 9 on the left.

The usual flattening of the staple to accommodate the blades and form the eye is only 15mm long as shown for reed #3, and it is mostly flat, getting a little steeper from filing just near the eye. It is the minimum outside dimension of the staple at the eye which is most critical for governing the contained volume between the reed blades. The size of the staple is important as part of the chanter bore, but at the eye of the staple this is dwarfed in effect by the much larger area between the reed blades just next to it.

Fig. 10.

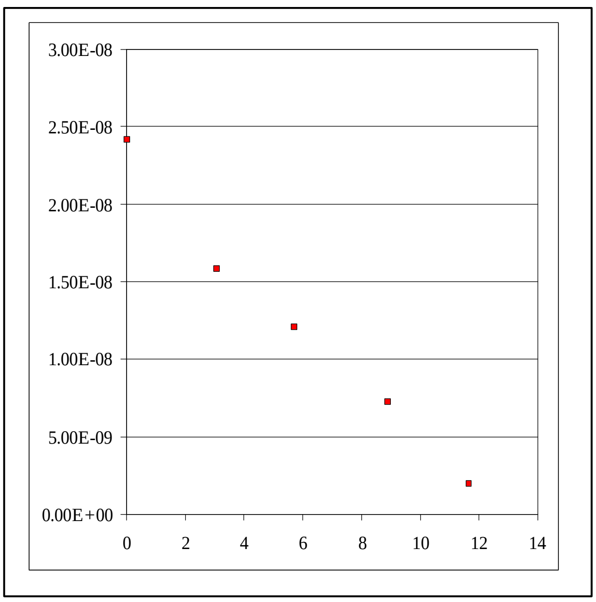


A cross sectional view of the back of a typical reed is shown in Fig. 10, left. The shape of this area is that given by the intersection of two circular arcs. The value of it is approximately given by 2/3 of the product of the width of the blades and their separation, which is in turn governed by the outer dimension of the staple, since that is what holds the blades apart. It is therefore important to try and duplicate not only the width of blades when copying them, but also to keep track of the distance between one outer face and the other.

There is a second factor contributing to the effective cross sectional area of a reed head. Somewhat beyond the scope of this article, it is well described in Nederveen.[2] This is the flexibility of the blades themselves as it changes along the blades i.e. the scrape. A body in which there is an acoustic field and which has flexible walls is acoustically larger than its physical size by an amount dependent on the wall flexibility. It is certainly possible for this to be a contributing factor in the effect of different wall materials and thicknesses on instrument tone. Considering how much the walls of a reed move when operating it is a very significant factor in reed design and the estimation of it is based on the pressure compliance of the blades.

The compliance (i.e. deflection sensitivity) of the best reed was measured over its length with a fine stylus and a vacuum retort. This information is useful when formulating acoustic models of the reed or when attempting to make very accurate copies of it. These compliance values are plotted in Fig. 11, below. This is another piece of information about these historic reeds, which is important to record.

Fig. 11.



In simpler terms we are looking here at the effect of scraping the reed. At the back of the reed where the blades are left at full thickness and tied to the staple, the compliance is low. At the tip end compliance is highest. This graph is one very neat way to think about the effect of scraping different areas of a reed. Scraping in one area of the reed carries the compliance increase from that scraping forward right along to the tip. In practical terms it does this by making the whole blade more flexible to applied pressure from that point on. As a secondary effect it also increases the apparent volume in the reed head by an amount directly proportional to

[2] C.J. Nederveen *Acoustical Aspects of Woodwind Instruments,* Revised Edition section 25, p31. Northern Illinois University press 1996. ISBN 0-87580-577-9

the change in compliance. It is obvious that scraping more at the back of the reed where the compliance is lowest gives the greatest potential change in compliance and scraping near the tip has less effect.

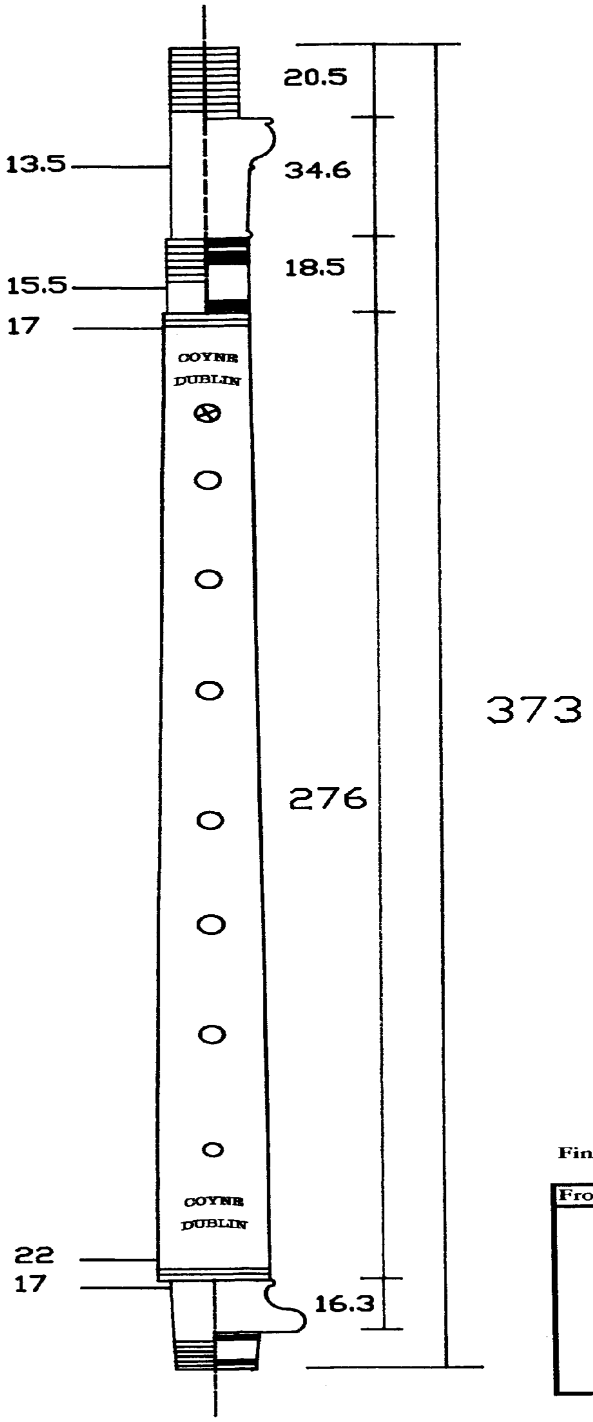
This graph shows how the maker of this reed has achieved a nice uniform increase in reed flexibility over the length of the scrape. The scrapes on the best of these reeds are worth commenting on. They appear flat and even, the work of a steady and practised hand.

The Pipes

It is a fine pleasure to play an old chanter with a good reed in it and I had the extra thrill of playing this Coyne chanter with a reed which had probably been made for it well over a hundred years ago. It was the next best thing to having a personal time machine. The tone is hard to describe but it was full featured and well behaved over the compass, and the strongest tonal impression was of a very clear and refined sound, as if the maturity of the parts could be heard in the sound produced. There were no unpleasant artefacts in the tone of this chanter and reed working together. The second working reed had a similar tonal quality but suffered from some tip leakage due to damage there.

The chanter is unkeyed, made of boxwood with an irregular wavy grain and acid stained to a rich orange colour. The wood is still pale under the fittings. The large top ferrule is made from bone with a smaller brass ferrule alongside it, the latter having a pattern of fine rolled lines. The large lower ferrule is ivory. The style of the bone ferrule is different to that of the ivory one, more reminiscent of M. Egan than the Coynes. It may be a substitute. The final ferrule of brass is a modern replacement. External measurements of the chanter body are given in Fig. 12 on the following page together with tables of the bore measurements and finger-hole sizes.

Fig. 12.



Bore Measurements

From Top	Bore Dia.
18	4.2
23	4.3
31	4.4
34	4.5
39	4.6
43	4.7
49	4.83
53.5	4.9
59	5
63.5	5.1
72.5	5.18
74	5.3
75	5.4
76.5	5.5
80.5	5.55
86.5	5.7
93	5.8
98	5.93
108.5	6.03
111	6.1
115	6.2
120	6.3
126	6.45
128	6.55
132	6.6
137	6.7
141	6.8
146	6.9
149	7
155	7.1
156.5	7.15
168	7.4
173	7.5
180	7.68
180	7.65
199	7.98
215	8.28
243	8.65
259.5	9
278	9.5
311.5	10
352	10.4
365	10.8
372	11
373	11.2

Fingerhole Details

From top	Width	Height	Body OD
103	5	4.7	17.3
122	4.9	4.9	18.0
150	4.9	5	18.4
181.5	5	4.9	19.0
218	4.8	4.9	19.8
247.5	4.9	5.3	20.7
278.5	4.8	4.8	21.2
311	3.8	3.7	21.9

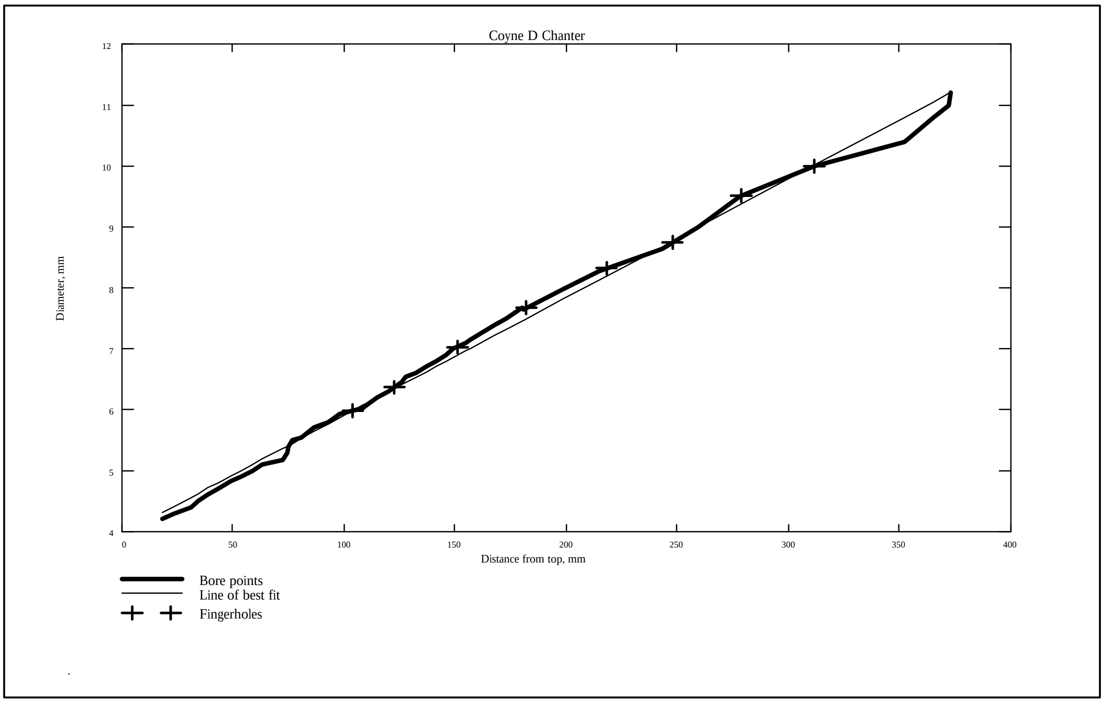
An unusual thing about this chanter is the evenness of the finger-hole sizes. Evenness of hole size is generally thought to be a good goal in open-fingered instruments in that it gives a balanced voice over the compass, but it might not be entirely optimal with the closed pattern of fingering commonly used on the Irish pipes. The holes are larger than average but appear completely original, unaltered. There is a nice pattern of finger wear over the holes and also where the thumb of the lower hand would sit at the back of the chanter. This chanter was well liked, well played and well reeded.

The even hole size raises some interesting questions about the intended fingering or playing style of this chanter. It is now more common to have a smaller hole uppermost in the fingerings which use two fingers off e.g. G in the bottom octave. This suggests that this chanter was intended to be played with only one finger off for G. The two finger G is indeed slightly sharp as are other two finger notes like B.

The lowest (E flat) hole is both smaller than all the others (3.8mm versus 5mm) and angled downwards. It is a fair distance away from the E hole. A hole like this is well situated to be a vent for the E hole and to correct some of the tuning difficulties usually associated with E in both octaves on account of its proximity to the closed bottom of the chanter. This E flat hole over-blows to a perfectly in tune second octave G.

On the plot of the chanter's bore in Fig. 13 below, I have included a line of best fit. It is there to highlight some of the subtle bore details. Small bore changes like this make a large difference to chanter tuning and behaviour. This bore is quite typical in the pattern of its deviations from a straight sided cone when compared to the work of other makers of the 18th and 19th centuries. It has a generally convex shape with local enlargement near the thumbhole and local reduction near the F# hole followed by a slight opening out towards the exit.

Fig. 13.



Finger-holes on Union pipe chanters are typically closer to 4mm than the 5mm seen here, and this leads to some interesting aspects of bore design. The throat is a little larger on this chanter as well, around 4.2mm whereas 3.9mm would be more usual. In general there is a close relation between average finger-hole sizes and chanter throat size and it can be reasonably explained in the following way: Enlarging a finger-hole without making any other bore changes will sharpen the notes that the hole produces, and it will sharpen notes in the first octave more quickly than those in the second octave. This gives the usual impression that the top octave is getting flatter as a hole is enlarged. It happens that one area of a pipe bore which can counteract this octave flattening effect is that near the chanter throat. Enlarging the throat generally sharpens top octave notes and may even flatten some low octave notes.

The usual "cost" of increasing chanter throat size is destabilisation of the chanter's hard D and a flattening of back D. The bore increase around back D helps remedy both of these and increasing the bore in the vicinity of the G hole further helps to stabilise the hard D. It's possible to discern in even this extremely basic consideration a tendency for bore taper rates to remain constant even though their overall sizes change. Here, as the finger-holes get larger, the throat also needs to be larger. As the throat gets larger, more adjustment is needed in two areas lower down and so the taper rate is more or less preserved.

As with every intact old chanter which I have measured, this one has all the hallmarks of being made by someone who was well acquainted with the design issues involved. It is truly remarkable that even the very earliest Irish pipe chanters and the Pastoral pipe chanters show evidence of this.

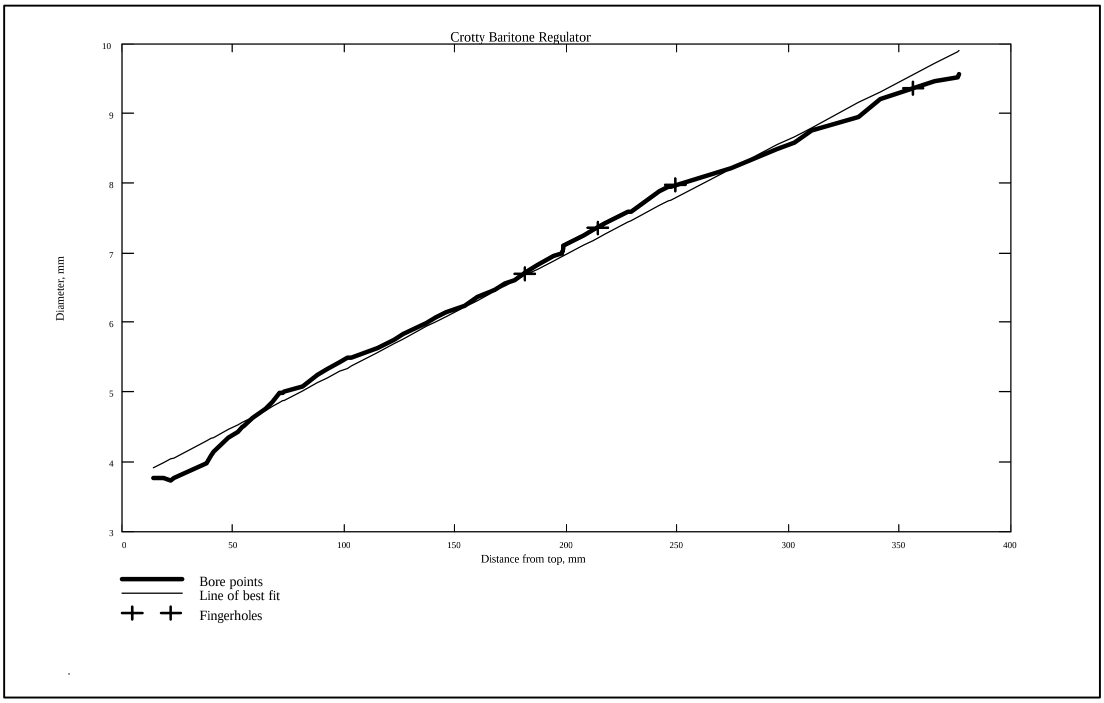
When a chanter is still associated with its original regulators, the bore and design of the tenor and baritone regulators is usually similar to that of the chanter. It is often the case that the bores are identical except in two areas. The regulators differ by having slightly smaller throats than the chanters and their bores tend to level off more below the F# hole. The same reamer or set of reamers appears to have been used over the rest of them as was used on the chanter.

This gives the possibility of reconstructing the missing Crotty chanter from the bores of the two Crotty regulators. The bore of the baritone regulator plus tone-hole spacing is shown in Fig. 14 on the following page. The tenor regulator bore is identical to this over its length within the accuracy of the measurements taken. Both are very similar to the Coyne chanter, but sufficiently different to this chanter and others I have data for to be considered distinct. Certainly a different set of tools made with a similar set of goals in mind.

The tone-hole locations on the Crotty baritone regulator correspond closely with those on the Coyne chanter. Finger-hole size differences between regulators and chanters together with the throat differences mentioned above support the following ideas about regulators: they are intended to produce notes in only their lowest octave no matter which octave the chanter is working in; one way of achieving this is to make any potential top octave notes flat; flattening top octave notes both makes them harder to achieve for transient octave changing reasons (the jump is harder) but more importantly at the same time as notes are flattened, they are also significantly weakened.

As in the discussion about chanter throat sizes above, keeping the regulator throat bore smaller flattens the second octave notes. The larger tone-hole diameters on a regulator, coupled with the fact that they have less wall thickness. also makes them relatively flat in the top octave when they do over-blow to a steady note.

Fig. 14.



I think there are some other possible bore moves which would make regulators even more stable e.g. tuning the regulator notes more by increasing the bore near the respective holes would also flatten the top octave. The idea of using a rush for tuning regulator notes should be applied sparingly, since making the bore smaller under a tone-hole not only flattens the note produced but flattens the bottom octave notes more, thus increasing octave separation. It would be better to achieve most of the fine tuning in the regulator reed and with permanent changes when the regulator is being built i.e. correct bore sizes and fine tuning the holes.

The idea of starting with the basic chanter bore to achieve notes around the same pitch as the chanter using a similar reed, and then changing the hole sizes and regulator throat size to achieve stability in one octave is a very good one. It is economical of tooling which must be considered at a time in history when good tools like the reamers used in pipemaking would have been very expensive items. In terms of the effort and expense required to develop and manufacture a good durable reamer today, it is still a valid consideration.

This is another very clear example of the inspired evolution of the Union and Pastoral pipes, a silent testimony to the fact the early makers of these had great skill in listening to the results of what they were doing. They were tradesmen in every meaningful sense of the word.

End