Favourable wind

If you think four manuals, dozens of stops and a full set of pedals on an organ are complicated, wait till you read about what happens beyond the public gaze. Words and pictures by **Raymond Parks**

The wind bloweth where it listeth – but we can't have that nonsense in a pipe organ!

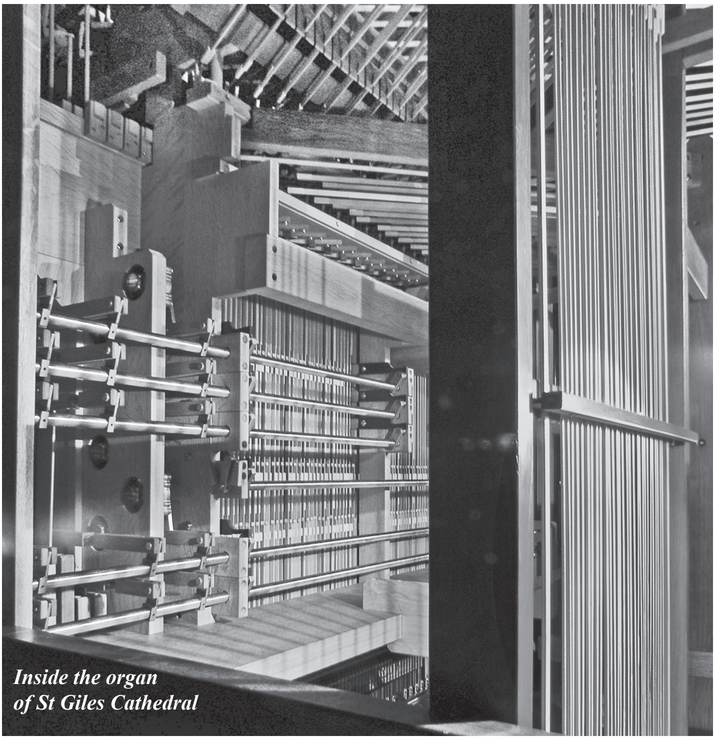
It's quite a formidable task to control the "air traffic" in one of these splendid engines, and we take for granted that the mechanism should be effortless and reliable.

The player has at his fingertips up to four, or exceptionally five, manuals of about sixty keys each, with a row of pedals and an array of plungers to select the pipes in groups of diverse tones.

Big organs may have more than 4000 pipes, mos of which are hidden within the casing – indeed the pipes which show off in front may not be real!

Contrasts between four examples selected from the outstanding organs in Edinburgh provide a useful insight into variations of the design concept down the centuries.

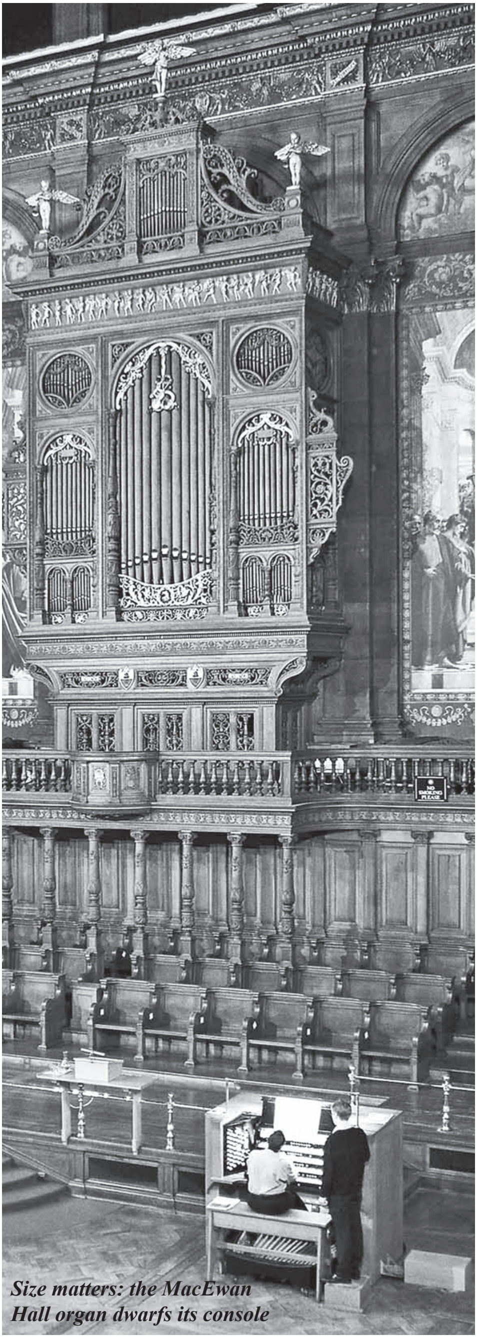
In the traditional design, the multitude of valves directing the flow are connected to the keys by direct mechanical linkages, cunning assemblages of push-rods, wire links and pivoted levers. These have to be light and responsive, with a minimum of inertia and springiness, compact and yet accessible for adjustment. This explains why in such instruments the player has his nose stuck in the middle of the casing, and his back to his admiring audience.



Inside the organ of St Giles Cathedral

The Ahrend organ in the Reid Concert Hall, built in 1977-78, derives its inspiration from early 18th-century German models, although it is not a copy of any particular one. Typical of that period is a restrained approach contrasting with our other three examples, with some 1500 pipes grouped in 21 stops.

The individual stops have strong "flavours", and are normally used in sparse combinations. The traditional siting is as a "swallow's nest" high up on an end wall, and I suppose to be proper, the access would be by a



Size matters: the MacEwan Hall organ dwarfs its console

ladder, but in our case it is by a boxed-in zig-zag staircase.

The much bigger instrument in the adjacent McEwan Hall represents a major turning-point in organ development. The graduation hall was completed in 1894, magnificent in many ways but with no provision for an organ. Space was not only limited but dispersed in a number of locations behind and above the stage area. A timely rescue from this unpromising situation came in the person of Robert Hope-Jones, a telegraph engineer gone astray, with his pioneering electric action which made it possible to unite the scattered elements into a very grand instrument indeed, which he completed in 1897. His design used an all-electric movable console, a feature which was enhanced in the 1953 rebuild, giving the player scope for as much theatrical display as he may wish.

His innovations included the extraordinary "diaphone" rank, low-pitched reed pipes of great sonority. While in principle the action is akin to a clarinet reed as in conventional high-pitched reed pipes, for the diaphone the moving element would be better described as a wooden trap-door! The lowest octave, termed "32-foot pitch", has fundamental frequencies descending to 16 Herz, and sometimes doubts have been raised as to whether this whole rank sounds a bit strange. It may well be that this arises from subjective perceptions of pitch and timbre for sounds whose fundamental (and indeed second harmonic) are below the limits of hearing, and that it differs from one person to another. I have analysed the spectra on a couple of occasions after the tuners had been in action, and the measurements gave a clean bill of health: the pitches precise, the envelope of spectral peaks smooth, and each note uniform in character with its neighbours.

The lowest notes of a piano have similar problems of pitch perception, accentuated by the fact that their component frequencies are not exactly a harmonic series (because of the effects of wire stiffness). This means that each offers a slightly different impression of pitch, adding up to what one of our sixth-year studies students called "grumbly uncertainty"!

Another distributed installation which was made possible by the electric action was built by Hope-Jones in 1899 for St Cuthbert's Church, with revisions by Walker in 1957 and 1999. It is effectively two instruments in one, the larger in the nave and the

An unusual wide-angle shot of St Cuthbert's

smaller at one side of the chancel with the combined console on the opposite side.

Although much effort has been put into making electric-action keys that "feel good" to the player's fingers, the direct mechanical action has certain qualities that many expert organists prefer, and the very fine and grand organ built in 1992 by Rieger for St Giles' Cathedral once again uses this system, albeit with the inclusion of some electrical devices to help the player with management functions. The price that the player is happy to pay is having his nose stuck in the middle of the great box! It is fascinating to see the centuries-old design concepts implemented with modern materials and manufacturing techniques.

The performing characteristics of every organ are inseparably wedded to the acoustics of its building, especially if that is very reverberant. This shows clearly in the contrast of the Reid and McEwan: the Reid is quite dry, at least for the lower frequencies of organ sound although less so for trumpets, and the organ is fairly free to do its own thing; on the other hand the McEwan is heavily reverberant with a six-second period at 1000Hz, and this affects the sound dramatically.

While most people readily understand reverberation as meaning that the sound takes time to die away after you take your finger off the key, it may come as a surprise that the sound takes a similar time to build up to its maximum after you first depress the key. There is a vast repertoire of music written to exploit the character of the one or the other instrument, although some of it may work well on either.

Variations of temperature and humidity have always made trouble for organs, and as well as changes from day to day there can be significant change in the course of a concert. The most basic effect is that the pitch changes, raising problems when playing with other instruments. The finely adjusted action may begin to stick as the wood swells or warps, and the McEwan has had some bad days in the past year when the humidity control malfunctioned.

It is not only fluctuations that cause suffering, the steady-state level can be simply too hot for health. The audiences of today come from centrally heated homes, and they expect a comfortable heat in the hall at ground level. Because of convection, the upper regions of the hall are much warmer, and woodwork which was fine in the conditions of a century ago begins to warp and crack and leak.

So, as you sit comfortably and enjoy a fine performance, spare a thought for the people who made the instrument and those who now keep it working.

And finally, a wee message from our sponsor. Edinburgh University runs a varied programme of lunch-time recitals in the Reid and the McEwan throughout the year – free, and never disappointing!