

How Organs Work

Geoff McMahon, former head designer at Mander Organs, explores what makes the organ the 'King of Instruments'. Describe an organ as the 'King of Instruments' and what comes to mind is imposing casework dominating the stage of a concert hall or the final shattering chords of a French toccata echoing around the vaults of a great cathedral. However, this description equally fits the organ's status as the consummate expression of technical development in instrument-making.

The organ defies conventional characterisation. Its pipework takes the form of many woodwind instruments but also aspires to the tonal attributes of the brass and string families. Some organs even have entire percussion sections concealed within them – though not, as a rule, those in churches.

From key to pipe

Each row of keys ('manuals' if played by the hands, plus a set of foot pedals) controls its own group of pipes known as a 'department'.

In a typical three-manual English church organ, such as St Peter's, the departments are called:

- 'Great Organ' (the primary source of the characteristic 'principal' organ tone).
- 'Choir Organ' (containing pipework of a contrasting and/or accompanimental nature).
- 'Swell Organ' (comparable in size and power to the Great, but whose pipes are enclosed in a sound-proof box with moveable shutters to allow dynamic effects).
- 'Pedal Organ' (the largest and deepest pitched pipes in the instrument).

Each department's pipework is grouped together on its own 'soundboard' (or, as the Americans more aptly call it, 'windchest'). This is mounted on a 'building frame' within the instrument. The soundboard is best envisaged as a matrix. The x-axis consists of sprung valves ('pallets') that represent the notes on the keyboard, while the y-axis is a series of sliders controlled by 'stop-knobs' at the console to allow or prevent the flow of wind into the various ranks ('stops') of pipes.

The pipes do not typically stand on the soundboards chromatically (ie, in the order of the notes on the keyboard) as this would be an inefficient use of space and prevent the organ from sounding in tune. A device known as a 'rollerboard' (commonly positioned immediately beneath the soundboard) is therefore needed to transmit the movement of each key laterally to the correct pipes.

A complicated structure of mechanical lever beams moved by solenoids (called the 'coupler chassis') surrounds the keyboards and enables the pipework of one department to be played by the keys of another.

Winding

A constant supply of pressurised wind is a prerequisite for making the pipes speak. An 'organ blower' – a person working a heavy lever to operate a set of feeder bellows – has today been replaced by an electrically powered, centrifugal fan which feeds into a network of wooden (and/or metal) trunking.

Wind pressure is traditionally regulated by 'reservoirs' (wooden boxes with weighted floating top frames and leathered gussets). 'Tremulants' are often installed at strategic points in the wind system to induce a periodic fluctuation in pressure, creating an effect like vibrato in the human voice.

The theory and practice of winding is the topic of endless and heated debate among organ devotees. But, then again, that applies equally to almost any of the sub-disciplines that make up the art of organ building.

