Chapter 3

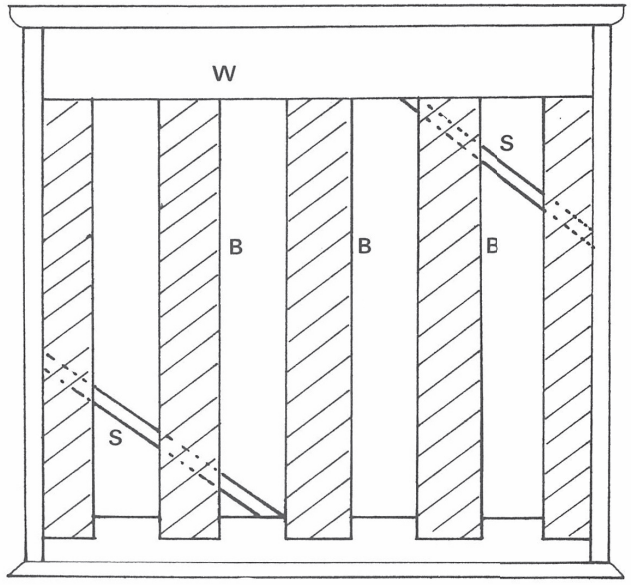
Structure and Sound-Producing Parts

Structure and Case

Basic Structure

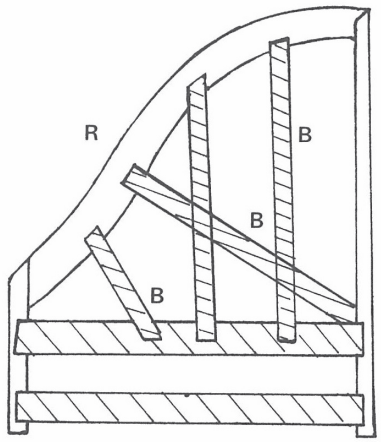
Normally the structural basis of the whole piano is the 'back', a framework constructed of stout timber (which may well be 10 cm or more in section) mortised together in the form of a surround with crossing beams or braces. The purpose of this is to support the soundboard and iron frame, with its tensions and great weight (see Fig. 9). In some slim-line uprights this back is very much reduced, there being no braces and the structural basis being the frame and thick surround to which it is screwed. Then the frame itself has to be strengthened and any increase here results in a sharp rise in total weight (usually for an upright in the region of a quarter of a ton, and for a medium grand perhaps one third of a ton) so that compromises have to be made.

The back supports also the side members of the case. In an upright these have minor acoustic importance, since the sound board is fixed primarily to the heavy back. In a grand, the sides one straight, the other a curved rim made of some ten hardwood laminations – have deep ledges supporting the soundboard and frame and the lower sides have the braces mortised into them well below the level of soundboard and frame. The soundboard edges are clamped down with a hardwood strip. As the whole structure is far more integral, it has also far more effect on tone (Fig. 10). The grand back is continued



UPRIGHT

W. Wrestplank (with tuning pins) and top edge of soundboard
S. Cut away edge of soundboard if board does not cover whole back
B. Braces – design varies



GRAND (*from below*)

R. Laminated hardwood curved rim
B. Braces – design varies

Fig. 9. Typical braced backs.

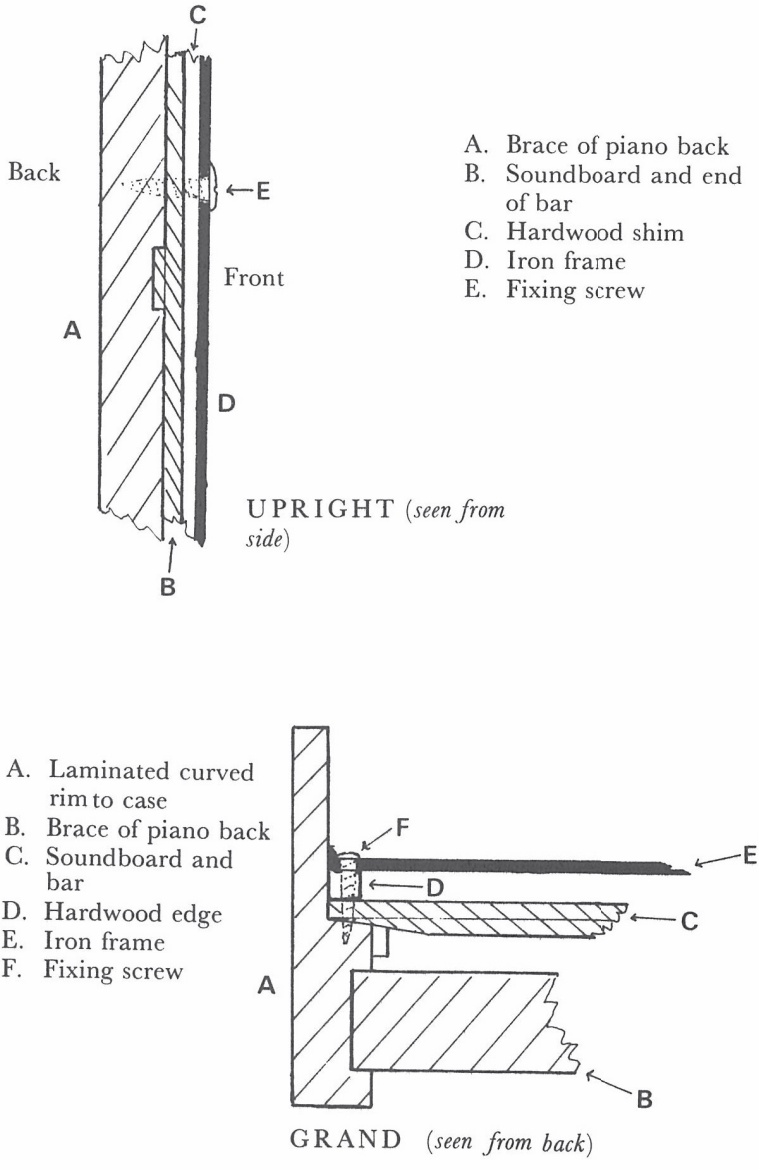


Fig. 10. Sections through sides.

forwards into the bed, supporting the action and keyboard, whilst the wrestplank containing the tuning pins rests on wooden blocks at the sides and is screwed to the frame in the front. The lack of support for the grand wrestplank and frame at the front is an unavoidable weakness. The upright's wrestplank is glued and screwed firmly to the beam at the top of the back and the soundboard goes right up to it. The grand's soundboard must of course stop short of the wrestplank so that the hammers can rise between – this also is an unavoidable defect (Fig. 11).

The sides of both models extend to the front in the form of curved 'cheeks' between which is situated the key-bed, a structural framework which is fairly massive in the grand since it carries the weight of keyboard and action and also indirectly of the front frame and wrestplank. In the upright the key-bed is less substantial and can usually be removed without difficulty for re-stringing and other purposes. Often it is supported in the middle by a cast bracket projecting from the frame and is screwed into the cheeks from below. Sometimes the cheeks have to be removed from the sides together with the key-bed. The columns found at the front of older (and a few classic modern) uprights as a rule do not support the key-bed but are ornamental. On recent uprights the sides and cheeks may be finished as, or actually be, single pieces of wood or blockboard, but on older models the cheeks are separate and screwed into the sides, and this method also is still used. At the bottom of uprights is the 'bottom

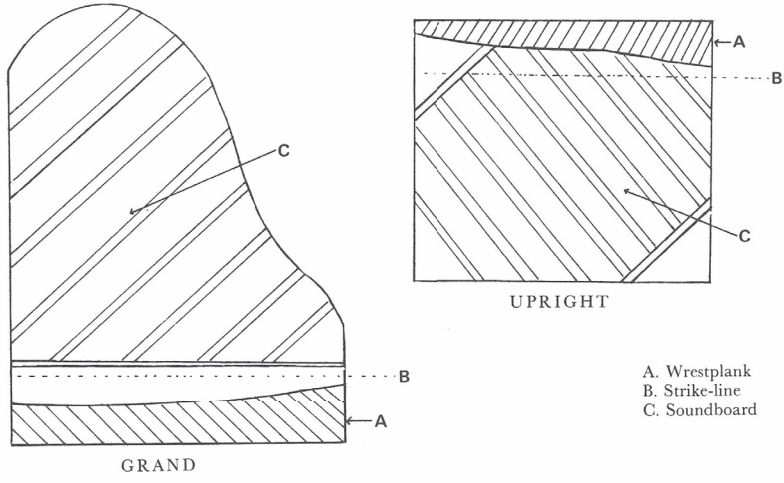


Fig. 11. Soundboards and strike-lines.

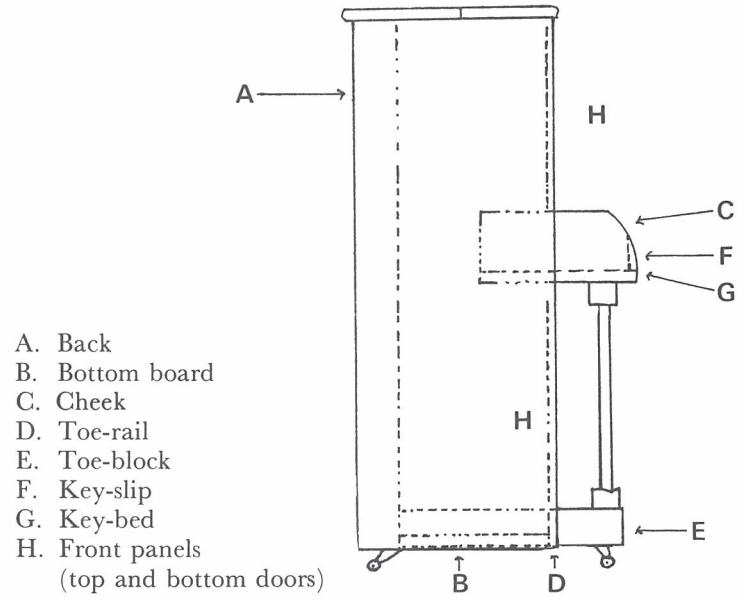


Fig. 12. Case and structure of (older) upright.

board', supporting the pedals and on older models usually glued and screwed to projecting 'toe-blocks' on which the columns stand. The weight is largely in the frame, but strong bottom corner joints are essential to prevent danger ous rocking backwards and forwards. Some modern uprights without good toe-blocks develop weaknesses here (Fig. 12). In the grand, the weight is of course spread over a larger area and is taken by three (occasionally six) legs, usually with some form of castor and often a brass cap. The legs are detachable by various devices for removal purposes, but take a great deal of strain if the instrument is pushed sideways. Square tapered legs have long been the fashion (save in reproduction models), but polygonal or round legs with ornamental grooves and turned or carved tops were usual until about the time of the First World War.

Fittings

There are various removable covers and fittings which have no structural importance and little, though sometimes adverse, acoustic effect. Music desks vary according to date rather than convenience. A really satisfactory and convenient music desk has yet to be devised.

Desks of grands were often elaborately fretted until the First World War, then sometimes made with a few straight slats, and most recently take the form of a solid wooden panel. The latter blocks the sound and the former is contrary to modern taste; the slatted type has much in its favour. The desks are hinged to a ledge ending in side-shelves which slide in felted grooves let into the sides above the wrestplank.

Desks of uprights, vintage and veteran, are hinged to the front panel and can be folded back into the top of the instrument. They have the drawback that they obstruct the 'fall' (the lid over the keyboard) when it is opened for playing and they tend to mark the front panel when they swing sideways. The more modern form is a ledge hinged inside the fall. This tends to be rather poor for holding music, especially if the front edge of the fall is not hinged and so catches the spines of music books, and may inadvertently be shut down on top of the keys. A recent attempt is a full-width desk worked into the hinged front of the fall. When the fall is opened, the front is folded down and reveals a grooved rest on its inner edge. This is neat, but the music tends to come too nearly vertical to the front panel and is unstable. Despite its inconvenience, the old swinging desk was the best arrangement purely from the point of view of holding music to be read. It is now very general not to fit the familiar clips for holding pages – in some designs there is little room for them. Sometimes rubber buttons are provided instead. Many pianists regret the passing of the clips and it is in fact quite possible to fit a pair for oneself on most types of desk.

The mounting of upright and grand falls differs greatly. In old uprights the fall is hinged to a concave beam well above the keys, down from its shape as the 'hollow'. The hollow slots into place between the cheeks and also receives the front panel, which is usually located with short dowels into holes in the hollow. Just below the hollow, and above the keys, is the 'nameboard', running full width, sometimes bearing the trade name (though this is often on the underside of the fall) and with a felt strip below it to prevent dust entering the case between the keys. Modern preference is for lighter and less curved arrangements. Sometimes the fall is hinged directly to the front panel, which extends down and may replace the nameboard. This can make removing the panel rather difficult. More often, a thinner wooden strip replaces the hollow. With the hollow it appears externally that the fall must cover half the keys when open as the piano-hinge runs down the middle. This is an illusion (though not always entirely so) arising from the use of deep key beds. The old falls were curved, made of two or more shaped parallel strips glued together and with

no hinge at the front edge. Nowadays falls are usually straight and reach back almost to the front panel, with the hinge virtually in the angle. As a rule, the front edges of these falls are hinged. Whilst there are other arrangements, the falls of grands usually pivot in slotted plates in the cheeks, so that they can generally be lifted out without any unscrewing. (See Fig. 13).

Both upright and grand have a strip of wood in front of the keys which conceals the keyframe and felts below the keys. As it often contains the lock, this is sometimes called the 'lock rail', but is more often known as the 'key-slip' (though this may also be a thinner strip behind the lock rail). The key-slip may be screwed in from underneath (uprights and grands), or held in place by rebated 'key-blocks' (most grands), in which case it may locate in the key-bed with dowels. In uprights it may be a fixture, since the key-frame can be lifted out, but

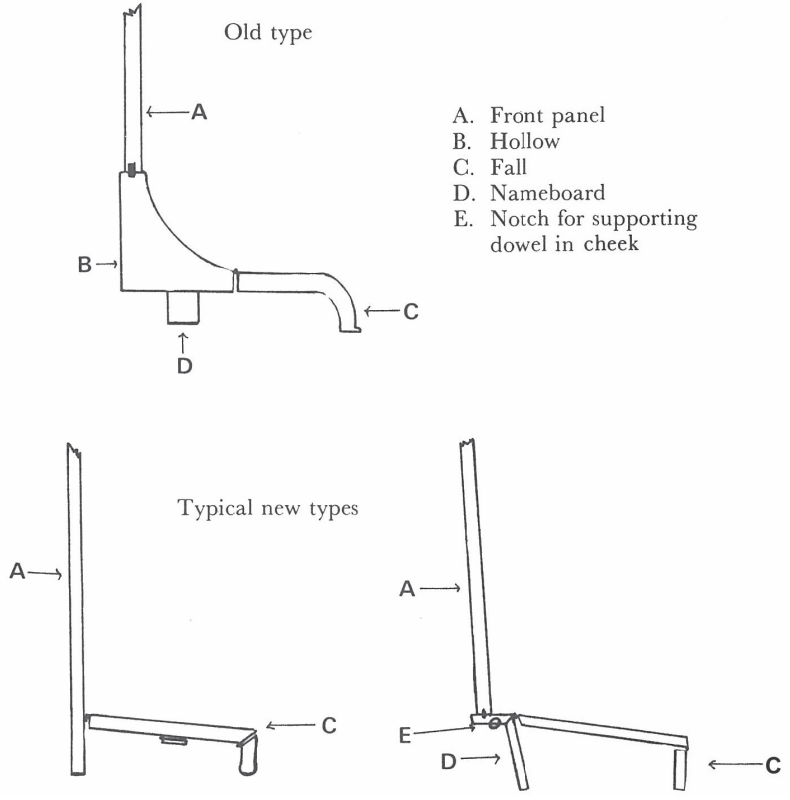


Fig. 13. Old and new upright fall arrangements.

with grands it must be removable so that action and key-frame can be slid out forwards. The key-blocks of the upright occupy space taken up by the pedal connecting rods and frame behind. In grands the treble key-block has an adjustable stop and a locating place for a pin from the key-frame, since this moves to the right when the soft pedal is used. Grand key-blocks are almost always held in place against the cheeks by large bolts or screws under the keybed. Uprights' key-blocks may be screwed in behind the nameboard or obliquely, below the level of the keys so that some keys must be removed before the key-blocks. (See Fig. 14).

The various lids are not so called on pianos. As we have seen, that over the keys is called 'the fall'. The principal covers are known as the 'top', that of the grand having front and back halves hinged to each other. Until about 1915 it was general for the back half to be secured by a 'rose' or 'turn-buckle' catch in the bent rim, but this has since become less common – the top is always taken off completely if the piano is to be moved, anyway, so the catch has limited use. There may be long and short props for the top, which tends to be removed for concert performance but has a marked directional acoustic reflecting effect if left in place and open. Upright tops show considerable variety, some opening at the front and some at the right hand side (more like a grand top). In older uprights the back half of the top over the wrestplank is fixed and hinged to the front half which opens. There are many forms of props and stays, as there are of catches for holding the front panel to the sides. Often the latter are badly positioned or insubstantial and cause disagreeable vibrations. Ideally, pianos should be played with the top open, but of course there are many reasons why this is often not done; in particular, playing with the top shut can seem agreeably mellow if in fact the hammers are overdue for toning and the sound seems too bright with the top open.

On uprights the bottom panel beneath the key-bed – sometimes known as the 'bottom door' – normally locates in the 'toerail' (a front edge to the bottom board) with dowels or against metal plates, and it is secured by springs or wooden struts or swivels which allow it to open when turned or raised. This panel is a common source of unwanted vibration. In older pianos recessed pieces of plywood were often used to give a panelled effect to the top and bottom doors. These frequently shake loose and vibrate when notes of particular pitches are sounded.