

## Chapter 1

# Tools and Materials

Piano servicing and repairing are carried out largely by professionals at the present time and their world is somewhat jealously guarded. Some retail shops will take on repair and full restoration from the public, as will some makers, but their custom is secured mainly through tuners as intermediaries. Qualified tuners have of course practical technical experience but naturally some are more interested than others in adjustment and repair, and shops which undertake restoration vary as to what they do themselves and what they subcontract. Sometimes, for example, they prefer to have whole actions rebuilt by specialist firms, by the action factory or the piano factory (since most piano-makers do not make their own actions any more than they cast their own iron frames). This then is a rather exclusive world of specialists fed by other specialists. The outlets for materials and tools often do not take kindly to amateur enquiries which may be ill-informed or result in small and time consuming orders.

There is no denying that the situation is difficult, but as amateur interest in this field grows it is likely to improve. Some firms listed in the Directory (included in this book's Bibliography) will prove helpful, there are occasional advertisements in Exchange and Mart, and library research may produce other sources. If you require the correct materials you are likely to have to accept placing an order for larger quantities than your immediate needs. The alternatives are to confine yourself to work not requiring replacement material or to do your best (bearing in mind always the instrument's value and ownership) with substitute materials. There is still scope for improving a

basically sound piano or for restoring a derelict instrument within these limitations.

## **Tools**

With regard to tools, the absolute essentials can be obtained from good music shops, tool and hardware shops as appropriate, and others can often be made up from material readily available. There is of course a wealth of gadgetry for particular specialist jobs, but most of these can be carried out more slowly without such labour-saving devices. The use of some of the tools mentioned will not be immediately apparent but will be explained in later chapters.

As a basic outfit for adjustments (Plates 1a and 1b), you need a tuning lever (also called a tuning hammer), a tuning fork and possibly a pitch pipe, at least a pair of mutes, a variety of screw drivers, and several slotted tools which you can make. A spiral 'pump' screwdriver is useful for the many repetitive screwing jobs. Brass wire brushes (as for suede shoes) are useful for cleaning action woodwork and a dental mirror is helpful for glimpsing the inaccessible.

Tuning levers come in 'T'-shape and goose-neck shape, the latter being more widely available. Which you use is a matter of personal preference - some tuners feel the downward pressure of a T lever is better with a grand piano, but it is not essential. Modern sockets will not always fit the older tuning pins, but it is possible to adapt small socket spanners for the purpose, fitting new handles of steel rod or filing the driven end to fit the existing head of your tuning lever. Probably the most useful tuning fork is 'A-440' (being at the 'concert pitch' of 440 cycles a second) and however limited your ventures into tuning you should have one of these as a standard. You may also find it helpful to have a pitch pipe - like a mouth-organ - of chromatic notes for an octave in the middle range of the piano. These can be obtained from music shops, but do not buy a guitar-tuning pitch pipe as its range will not be suitable. Mutes are wedges of felt or rubber, being about 15 mm wide, 10 cm long and tapering to a point down from about 25 mm at the thicker end. If you cannot obtain the genuine article it is possible to make substitutes from hard felt polishing buffs (sold as accessories for electric drills) and even from rubber shoe-heels. The rubber wedges sold for holding sash windows are also usable. Generally felt of the right texture silences better than rubber and causes less of a 'thud'. The essential is for the mute to silence musical vibrations and to stay in place; home-made mutes are

satisfactory but may give rise to distracting noise. There is a special type of expanding mute, looking rather like scissors, and muting two strings at a time; this Papp mute is not essential but it does make muting uprights easier since it can be inserted between the hammer shanks and rest on the hammer rail rather than slipping out into the depths of the piano. As for screwdrivers, you will need a large one – say 35 cm with a 15 mm blade – for work on cases and frames, one or two in-between sizes for general work, and a long narrow-bladed screwdriver for reaching into actions. Finally, a thin rod – say 20 cm by 2 mm – or a hexagonal nut spanner of about 5 mm may be needed to adjust capstans on keys; these vary in form but generally these tools or long-nosed pliers will turn them without damage.

The slotted tools are used in adjusting actions – regulating; particularly for bending fixed wires and springs and for turning the eyelet or stub-headed screws by which the escapement of the action is adjusted. You could make them up from steel rod (about 5 mm) as you go along, but for most regulating you will probably find useful along (20 cm) right-angled lever with a slot 3 mm wide and about 1 cm deep. The slot can be made with a hacksaw and if necessary shaped with another saw or fine file. It is also possible to make a slot in an old screwdriver for this purpose, but the angle of the lever in the other tool can be helpful when regulating uprights. A slotted tool of a rather peculiar shape can be formed from similar material so that – after considerable practice – it can be used for adjusting uprights' damper spoons without removing the action from the piano; such a tool can also be bought and its use will be apparent later.

A special tool is useful for adjusting the dampers of grands (which can be done only with the action out of the piano). It can be made from a wooden block of about 10 cm long and 25 mm square, with a hole in the middle of the length. Through the hole goes a countersunk bolt some 7 cm long, and there is a fairly stiff coiled spring between block and wing-nut washer. The nut holds in place, but at adjustable height, a strip of material (wood, or metal or plastic) 3 mm thick and about 5 cm by 7 cm. (The only really critical dimension for this tool is that the slip be 3 mm thick as this an essential distance in regulating the dampers.) This gadget, as we shall see, is a means of relating the height of the dampers to the ends of the grand keys even though the action is out of the piano.

When you pass from tuning and general regulating to toning – working on the hammer heads – you need a few other tools. First and foremost are toning needles and holders. Commercial holders

contain a row of three miniature clamps into which the needles are fastened. You can, however, get on perfectly well with darning needles in a good pin vice; using a single needle to tone a whole piano is a long and arduous business, but on the other hand it does reduce the very great danger of irretrievable damage being done to hammer felts by excessive needling - it compels the whole process to be as slow and gradual as it should be. If you are going to do any reshaping of hammers - and with old and unattended pianos this is hardly avoidable - you need to make up sand-files from various grades (centring on Medium) of sandpaper stuck with contact adhesive round strips of wood of convenient size - about 5 mm by 1 cm by 25 cm long, but the size is not critical. For other work on felt throughout the action and keyboard you need a very sharp knife - a trimming knife for which you can buy sets of blades is best - and a metal straight-edge. If, as may be, you cannot obtain commercial felt buttons or washers (used extensively beneath keys), you will have to make a great many to build up required thicknesses. An adjustable leather punch will make the central holes. For making the felt discs it is possible to construct a cutter from steel tubing with the outside edge ground sharp, the length being about 25 mm. The sizes most often used are 1 cm and 2 cm. Cutters made in this way should be hardened by heating to bright red and plunging into cold water. They are then used by compressing stacks of felt against them in a vice, with a soft jaw of wood used as a backing for the felt. A dowel plug-cutter in a hand drill can also be used for cutting felt discs.

Stringing requires special tools. You should have a smallish pair of top-cut nippers for cutting the softer wires used in piano actions. These cutters will be badly damaged if you try to use them on the piano wire used for strings; for this job you must obtain nippers with hardened blades and preferably with cantilevered handles - your tool shop will advise you if you explain that they are needed solely for cutting hard steel wire. Strong pliers are also needed - do not waste money on cheap ones with poor joints. Pliers with rounded jaws are very useful for bending tight curves in wire. It is desirable for the coils of strings on tuning pins to be touching each other and they do not always come out that way unaided. Therefore it is worth having a special lifting lever. This you can buy or make out of bent steel strip about 3 mm thick, shaped and notched with a file, and it should be backed with a slip of hard leather so that it does not scratch the frame. Make it 1 cm wide so that you can cut in the other end three equally-spaced slots which you will use to secure even

spacing of the strings, or cut another strip for this tool. For knocking in tuning pins you need a fairly heavy hammer-say 2 lb. It is better to avoid claw hammers because of the risk of damage by the claw, and a fairly short haft is conducive to accuracy. A lighter hammer will be needed around the case and action and for tapping strings into place. If you have a torque wrench then regard it as available for work on pianos, for it is a useful accessory if you fit it with a socket which will grip tuning pins, but an expensive and inessential item.

Whilst adjusting pianos is not entirely a matter of scientific measurement, you need a good measure with clear fine divisions (for example a steel ruler), you can make use of a feeler gauge (mainly for internal comparison so whether or not metric in style does not matter), and a micrometer is valuable for measuring wire gauges; however, the micrometer is a luxury like the torque wrench and you can always present samples of the string to be replaced if the need arises. Certain gauges can perfectly well be home-made (see Fig. 1). For example, you need a strip of metal or wood 50 mm long, as this is the average standard distance which a piano hammer should be from the strings when at rest and it must be accurately measured if the piano is to give of its best. Another valuable gauge is for measuring key-dip – the distance which a key travels from ‘up’ to ‘down’. This can be a small block, the width of a white key and 10 mm thick at the front, tapering to nothing at the back and 50 mm long. The height of the black keys (‘sharps’) above the white keys can be set with an ‘E’-shaped piece of metal or thin wood. This height is normally  $\frac{7}{16}$  in or 12 mm above the white keys, so make your gauge with outside legs of about 30 mm length, with some 25 mm between them, and make the middle leg only 18 mm in length. In use, the outer legs stand on the white keys and the height of the intervening sharp is adjusted until it just touches the middle leg. A similar gauge, but with legs of equal length and of material (preferably metal) 5 mm thick, can be used with the feeler gauge to measure the important angles (‘bearing’) which the strings make relative to the top surface of the bridges.

A professional metal trolley for moving pianos is very expensive, but some form of trolley will soon be found necessary. A reasonable one can be made of heavy boards (say 25 mm) screwed together to double their thickness and mounted on four industrial-type castors – light domestic castors are unsuitable and dangerous. The wood can be about 25×45 cm. Cover the wood with carpet to protect the instrument, or with rubber to prevent it from slipping.

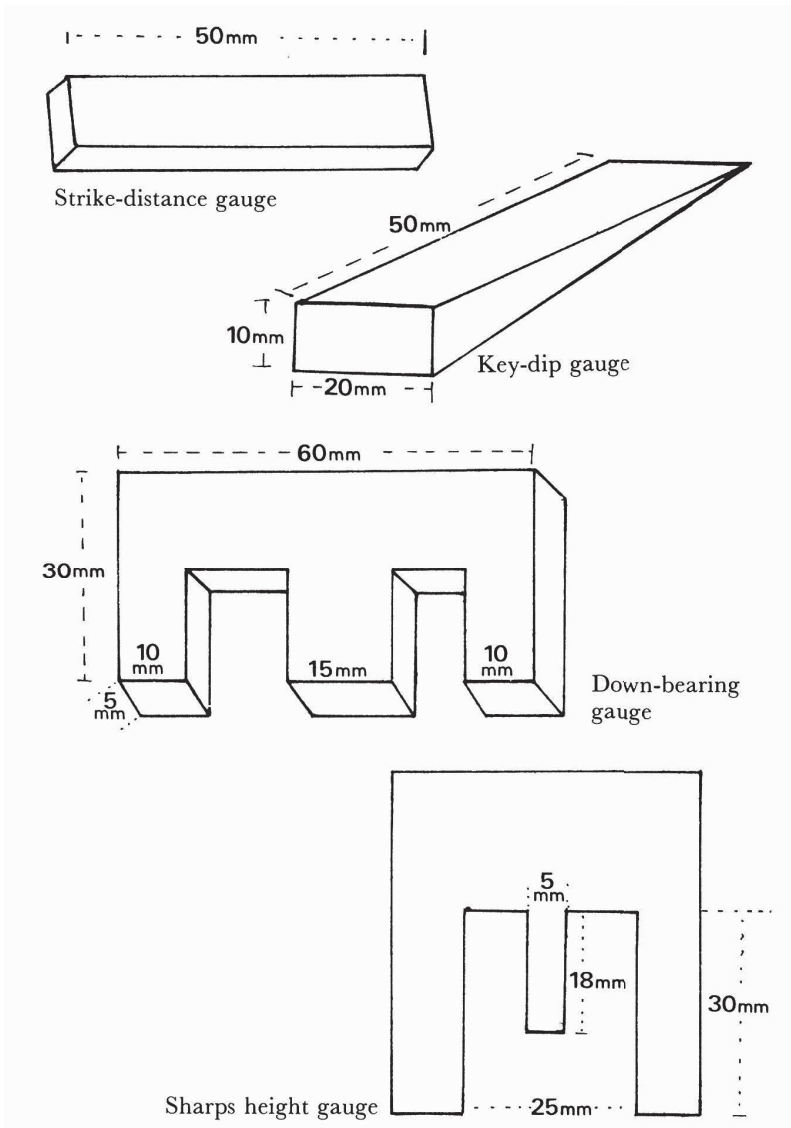


Fig. 1. Some home-made regulating gauges.

This may seem a formidable list of tools, but I have tried to indicate that the essentials are not in fact very many. There is no reason at all why you should buy or make at the outset all tools needed for a full overhaul, even if you are sure that the piano requires such extensive attention. The work takes a great deal of time and you can acquire and make more tools as they come to be needed. Most jobs can be done

without specialist tools – they simply take longer and try your patience more. Perhaps I may repeat here that an oscilloscope is not only inessential but is actually unlikely to be of any use to you in normal servicing and restoration work.

## Materials

In materials, the prime requirements are glues and felts. You need a strong wood-glue – Scotch glue in block or granule form for melting in a double pot has many advantages but of course is not always convenient. Many modern cold glues are quite satisfactory as adhesives but have the disadvantage that they are difficult to soften should the parts have to be separated in future. For felt not under strain a more flexible glue, which will not be absorbed yet not create a hard surface, is desirable. Here Copydex serves well and is easily removable if need be. Impact adhesives are useful for quick repairs but are not very satisfactory with absorbent fabrics or always strong enough for wood. Epoxy finds a special use in filling bridges and soundboards. It occupies too much space to be useful for much else and is, again, hard to remove. The use of the various cyanoacrylate ‘superglues’ is not recommended. They do not work well on wood or fabrics and they will not stand up to the strains imposed on piano metalwork. They are in addition very difficult indeed to remove without damage to an underlying surface.

If you can obtain commercial felts, start by ordering 3 mm check felt (hard and close), 4–5 mm cushion felt (soft and open), and such damper and hammer felt as you may need. Sheet felts are sold by weight and 1 lb of each sort will keep you going for some time. For some purposes good close felt from a draper may be used, although more than one layer may be needed (it is usually not more than 2 mm thick). The back of the key-frame-i.e. the wood beneath the back ends of the keys – and the hammer rail (on which the heads of uprights’ hammers rest) are usually covered with a thick green, very loose, felt known as baize, but it is possible to build up to the thickness here and for key punchings from several layers of thin felt. For small pieces, notably dampers, some chiropody felt is suitably thick and soft. True damper felt is sold in strips of the three common shapes and sheets for the rectangular dampers towards the top of the piano. (See Chapter 4.) There is a larger size for dampers of grand pianos. If you can obtain this damper felt cut to shape, it does a better job and looks tidier than any substitutes.