# BUILDING A BALALAIKA

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In starting this series of articles it will be appropriate to explain to the reader something about the balalaika and its history. It is obvious that to the average inhabitant of the British Isles the instrument is nothing morethan a Russian curio

## *Part 1*

The word “balalaika” is derived from a Russian verb which means to “chatter, to joke or to tease” and may thus be considered apt if we think of the bright, vivacious character of many of the songs and dances with which the instrument is associated.

In its triangular shape the balalaika is known to have emerged in the eighteenth century, and was evolved from the earlier form of “domra”, the round peasant instrument. Early instruments were crudely made and had a poor tone but, in the 1880’s, **V. V. Andreev** brought about certain changes of design and had balalaikas made in the patterns and sizes which remain today, elevating it to the status of the Russian national musical instrument.

*FIG. 1. THE AUTHOR PLAYING ONE OF THE INSTRUMENTS WHICH HE HAS MADE*

In its full range the balalaika is capable of forming a complete orchestra without the addition of any other instrument. This is possible because different sizes of the instrument are designed to play melody, accompaniment and percussion. The usual six orchestral sizes from treble downwards are: piccolo, prima, secunda, alto, bass, and contra-bass. The last-named can measure up to six feet in height!

All sizes of the family are fitted with three strings, but the prima, which will be the subject of these articles, has had innovations, such as six strings in pairs, and, more recently, four strings. However, no serious player to my knowledge ever played a balalaika designed for more than three strings, nor do I know of a tutor intended for such an instrument.

In this article I want to explain exactly what will be required to build the instrument, so that it will give you time to choose your materials carefully before the issue, in which methods of construction are discussed, appears.

**The Soundboard.**—The balalaika is based on the common principle of most stringed instruments in having the strings stretched over a soundboard or belly, which one may say is the most important part of the instrument. On the fashioning of this depend the frequencies of the vibrations which are transmitted, via the bridge, when the strings are struck. You must use quarter-cut softwood for the soundboard so that the lines of the growth rings of the tree run in a vertical direction. Cut in this manner the wood is most fragile, but what is more important from a musical point of view is that it is also most sensitive to vibrations.

Today, the only British imports of “tables”—as this belly material is called in the trade—come from the forests of Bavaria. The “tables” of Bavarian pine or European spruce will best suit our purpose. They come as two matched pieces about 21-22 in. long by 8-9 in. wide, and upwards of ¼ in. in thickness. Sometimes they are still joined together at one end, the piece having been deep-sawn almost through the length Unfortunately, these precious pieces of pine are not on common sale and are accordingly expensive when compared with the price of ordinary softwood.

The matched halves as supplied for a Spanish guitar soundboard will make two prima balalaika bellies with careful cutting, although you may consider this wasteful if you are only making one instrument. Many Russian balalaikas have the belly made of three or four pieces, and providing the pine is cut from the same board and carefully matched, there is nothing against the practice. Suitable pieces of pine can sometimes be found from “secondhand” sources, and old pieces of furniture may be well worth your inspection. Some of the linings of Victorian sideboards and drawer chests were made from excellent white or yellow pine. Look for pieces with the grain —the annular growth rings— running straight from end to end and fairly close together (not less than twelve to the inch). When viewed at the end of the board they should cut the face of the wood as nearly at right angles as possible. At a timber yard it may be possible to obtain the Sitka or silver spruce from Canada, but you may have difficulty in persuading the merchant to saw off one thin piece with what he would call the “comb” grain. Such timber is excellent for soundboards.

When the belly pieces are glued together, you should have a width of about 16 in. and a length of 10¾ in. Therefore, if you found a piece of suitable 12 in. by 6 in. by 1 in. it could be deep-sawn into three thin pieces and joined edge-to-edge to afford ample material. A thickness of 3⁄16 in. will give a good gluing surface when joining the pieces together, and if your material is a trifle fuller you will get an even better joint.

**The Ribs** — It should not be difficult to find suitable timber for the remainder of the instrument as there are several alternatives. The necks and ribs of many Russian balalaikas are made of plain birch, but I would not recommend its use. *Nalimov*, perhaps the greatest of balalaika makers, seems always to have used maple, which is abundant in Russia. The British sycamore, or great maple as I prefer to call it, has both the beauty and the necessary acoustic qualities, and I can recommend it for the ribs of the back and the baseboard. Other suitable woods for the ribs would be Cuban mahogany, satin wood, English walnut, pearwood, sapele mahogany and possibly some of the lesser-known Colonial hardwoods.

To obtain the required musical quality the density of the wood used for the back of the instrument is important, and the weight and nature of the maple family should be your guide in choosing. Select a wood neither lighter in weight, nor less dense in texture, than maple: in the finished state you should aim for a good appearance. Woods of an oily or resinous nature should be avoided.

The ribs may be made by deep-sawing material of 3¼ in. or so in width and obtaining matching pairs. Because of the changes in the figure of the wood, the thinner one can saw these pieces the better will be the matching. In any case, you should cut to ⅛ in. or less before starting on the final thicknessing.

To have the figure matching in the ribs makes a nice-looking instrument, but providing all the ribs are cut from the same material, uniformity of appearance is not essential. If, therefore, you have some thin wood which could save a lot of sawing and planing, cut out the ribs separately, but do try to arrange them tastefully so that the parts are equally balanced in design. Do not, for instance, have one rib heavily figured and its opposite number completely plain.

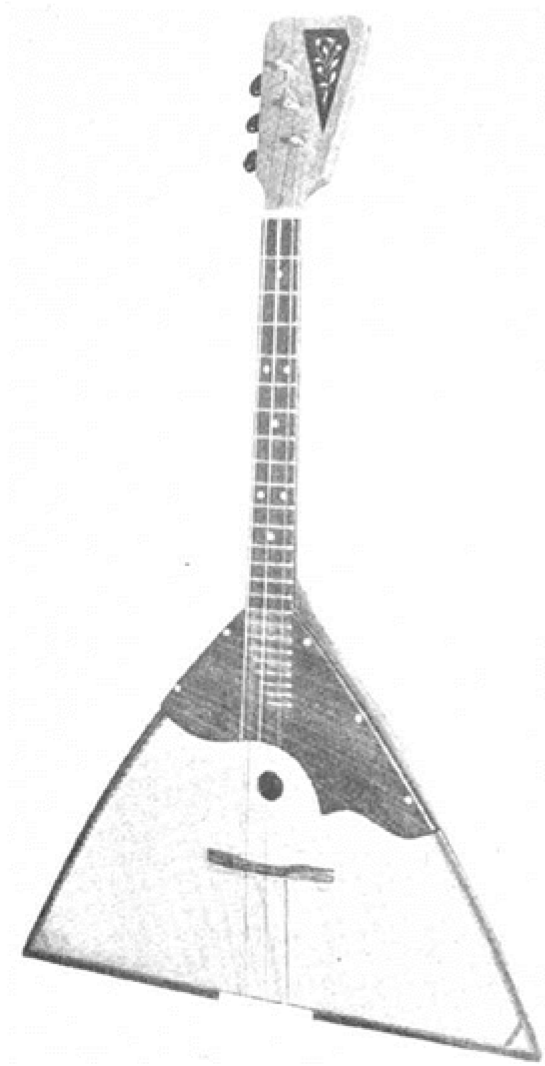


*FIG. 2. THE BALALAIKA, DESCRIBED IN THIS SERIES*

For making the ribs you will require two each of the following approximate lengths: 14 in., 11½ in., 10 in., 8¼in., 6½ in., and 5 in., the width being about 3¼ in.

**The Head and Neck** —The construction of the neck will vary according to the woods used. If it is made from a single piece—about 17 in. by 3 in. by 2½ in.—it must be reinforced with a thin sheet of hard, contrasting stuff such as rosewood or ebony through the length of it. This centre laminate will measure roughly 17 in. by 2½ in by ⅛ in. to 3⁄16 in.

Rosewood or ebony may be hard to find in these sizes, but I have found a suitable substitute which can often be seen in any greengrocer's shop. If you examine some of those reddish-coloured apple boxes which come from Australia you may notice in their sides—not the ends or the partitions—an excellent piece for your laminations. These woods are of the great eucalyptus family and, whilst many are unworkably tough and stringy, there are some which, with a little patience, may be brought to a nice finish. Many of them arc considerably heavier and stronger than rosewood.

One variety of eucalyptus *diversicolor* from an apple box I fashioned into a finger-plate for a balalaika in 1954 and it has proved excellent. When it was newly finished the colour was a most attractive pink, which has since deepened to a mellow dark red-brown. The slats of the apple boxes arc cut so thinly that they are usually well- seasoned by the time they reach our shops, but you should make sure of their absolute dryness before using them.

I like to use 1 in. thick rosewood (*Dalbergia*) for the neck, and the Indian, African, South American or Honduras kinds are all suitable. The main part of the neck is made from a piece about 12 in. by 1½ in. with a short piece of the same width glued at one end to make up the depth of the "heel". The head requires a piece about 8 in. by 3 in. by ½ in. of the same material.

Because of its slender shape the neck must be made of very strong material, and ebony has been used in many balalaikas; to my mind it is much too brittle. If the neck is made with a strong centre lamination you may well construct it from the same wood as used for the ribs, or alternatively fit a dark, contrasting neck to a light coloured body.

To make the bridge, use material of 5⁄16 in. thickness and mark out the shape, leaving some waste below the feet. After cutting out with a fretsaw, the waste portion may be held in the vice while the bridge is tapered off with a small block plane. It must then be tried exactly in its place and adjusted with glass-paper so that the feet make close contact with the soundboard at all points. It is finally glasspapered smooth but not polished.

The balalaika should now be completely cleaned up with "flour" grade glass-paper. All edges—except where the fingerplate touches the body—are slightly rounded and the surfaces brought to a glass-smooth finish. To achieve this it is necessary to rub down with the grain of the wood and, between rubbings, to damp down with a moist linen pad. This alternate damping and sand-papering will eventually bring a surface which will take the fine finish so admired in a good musical instrument. Afterwards replace all the fittings and prepare for stringing.

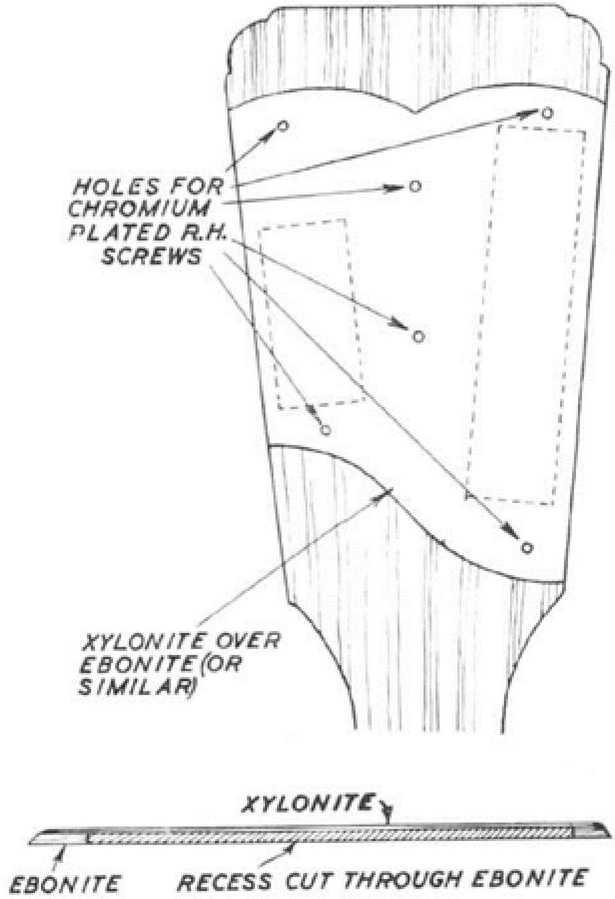


FIG. 7. DETAILS OF THE MACHINE COVER PLATE

**Stringing the balalaika** —Music shops in this country do not sell sets of balalaika strings, but they can be bought separately as supplied here for banjos and Spanish guitars. For the 1st. string (on the right as you face the instrument) which is tuned to A on the treble stave, I recommend a smooth steel banjo (not tenor or zither-banjo) 2nd. string. For 2nd. and 3rd., which are tuned in unison with E below the A, I use the Spanish guitar 2nd. string made of nylon. A good set of these strings will cost about 5s.

Having marked the centre point of the bridge with a small round "needle" file, make a shallow groove to take the string, with a corresponding groove in the nut. These grooves must be just sufficient to prevent movement of the strings when they are struck. First of all attach the centre string, as shown in Fig. 5 and 6, and then you will be able to adjust the height before attaching the other two. The banjo string has a loop which may be placed over the pin without knotting, and it is so thin that its grooves in the nut and bridge must be made with a very fine cutting edge to avoid unnecessary "play". Such movement of a string causes noises which are much amplified in playing the instrument.

The strings must be pulled up to pitch, each a little at a time, and you will find it takes some days for the nylon ones to stretch out and settle down. It is a good thing now for the instrument to be kept strung and played in "the white" for a few months, being hung up in normal room-light between times. It should be kept free of hand-soiling as it is used.

**Varnishing** — In this country this is best carried out in the dry summer months and it should always be done in a warm, ventilated room, free from dust and draughts.

I consider that a clear oil violin varnish is the best finish to use, but it requires considerable patience and time to achieve the best results. Apply it to the body of the instrument with a flat sable brush ¾ in. or 1 in. wide, and hang up by the head to dry.

This first coat will take upwards of a week to set and must be applied very thinly. When it is hard it should be rubbed down lightly with finest "wet and dry" paper. This treatment is repeated to 4 or 5 coats, allowing plenty of time to dry between applications, and then the head is dealt with similarly. The neck is treated with a good, hard spirit varnish in the same way. When all is dry the final polish is applied by rubbing the whole of the instrument with finest powdered pumice on a linen pad moistened with water. This will flatten the surface but make it rather dull. The glass-like finish is achieved by changing from pumice to tripoli or crocus powder on a pad moistened with soap and water. If you decide to use an all-spirit varnish finish you will not, of course, have the lengthy waiting for the coats to dry.

The instrument may alternatively be finished by french polishing methods, but if this is done no “filler” should be used on the soundboard. Follow a good manual on the subject and use only white polish, taking great care with the “fadding” to build up a good depth of polish. Because of the shape of the instrument you will have to modify the polishing movements, and the work is divided into definite stages. Do the back and base-board first, followed by the head and neck. The soundboard is best left until last. The finger-plate is left unpolished like the bridge.

It has given me great pleasure writing these articles and I hope as a result some good instruments will be created. The balalaika is an unusual instrument with a charm all its own, and evokes interest wherever I play. Let us hope it will re-awaken the popularity it once held in England and become again something more than an attractive wall decoration. In closing I wish to pay tribute to Nicholas Medvedeff who has been conducting his Balalaika Orchestra in Britain for the last 38 years. He taught me to play, has given me inspiration towards the culture of the balalaika, and in that way is responsible for these articles being written.

# *Part 2*

**The fingerboard and fingerplate.** The ideal material for any musical instrument fingerboard is black ebony. It is hard, is not likely to be affected by perspiring fingers as are porous woods, does not discolour through continual handling and may be finished to a smooth, natural surface. Other dark-coloured ebonies, including the striped macassar, are suitable, and the rosewoods such as African black wood, and the Indian and South American varieties have the necessary qualities. I would consider the Honduras rosewood suitable if it were darker in colour, but it does not change its shade with age as does the eucalyptus which I described earlier. If the other woods are not available, then by all means use a piece of the Australian wood: in any case you will require about 11 in. by 1½ in. by 3⁄16 in. without a blemish.

**The fingerplate, or guard**, is made preferably from the same material as the fingerboard so that one appears to be an extension of the other. If, however, this is not practicable, make it from a dark, close-grained wood of at least the same hardness as the fingerboard. It will take a piece some 9 in. by 5 in. by 3⁄32 in. with the grain running lengthwise.

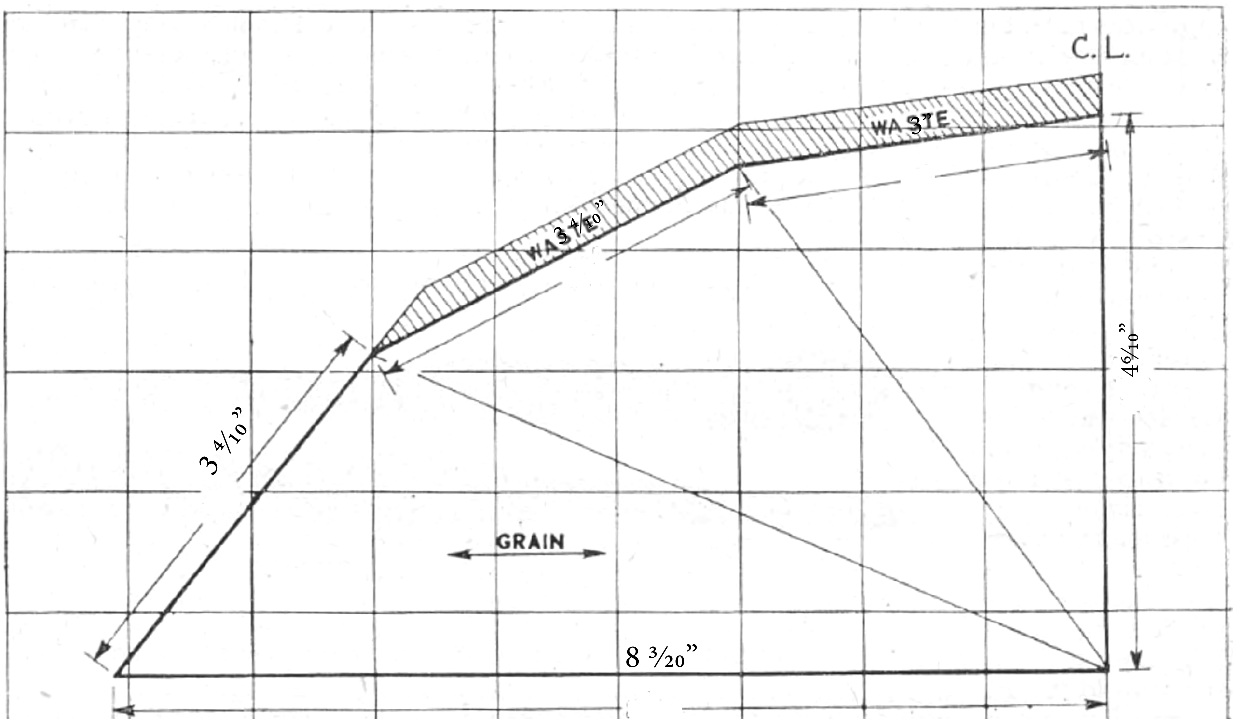



Fig. 1. Showing half the baseboard lining, marked off in one-ince squares. Note the shaded waste area, which allows for trimming up.

**The Bridge.** As this is responsible for transmitting the vibrations to the soundboard it must obviously be of a material suitable for that purpose. With orchestral players, maple bridges have been more common than any other type, but I suggest you experiment with different woods when you reach the playing stage. For solo playing, I prefer a bridge of Indian rosewood, but I have others made of various hardwoods, including the ebonies.

When you have obtained the necessary woods, put them in a dry, reasonably warm room for as long as possible prior to starting the work.

**Thicknessing** —There can be no exact instructions as to how thick a particular belly or rib should be. So much depends or the nature of the materials used that only general guidance can be given. With the right kind of pine, 2 mm. will be thick enough for a good soundboard and 2½ mm. should not be exceeded whatever your material. If the pine is very close-grained it will have a harder, more metallic sound than one with wider growth rings. Accordingly you would match it with ribs of medium density and thickness in order to get the best acoustic balance. But if the pine is more open-grained, it should be paired with ribs with the more brilliant tone to be found in the harder woods, and will be cut accordingly thinner. If you are making ribs of maple, 3⁄32 in. should be about right, but should not be thinner unless the wood is exceptionally hard.

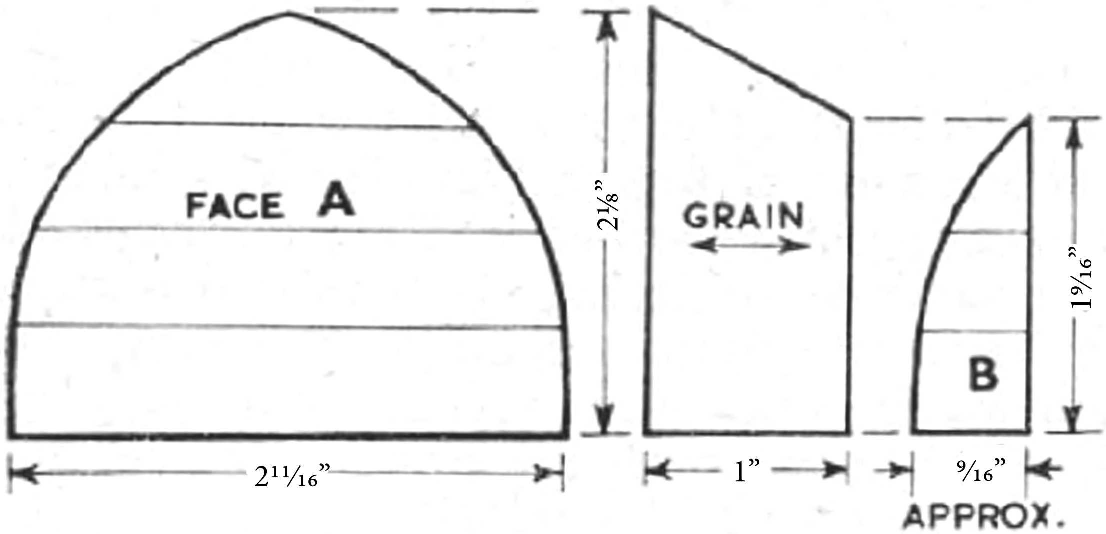



Fig. 2. DETAILS OF SHOULDER BLOCK. This can be either solid or laminated.

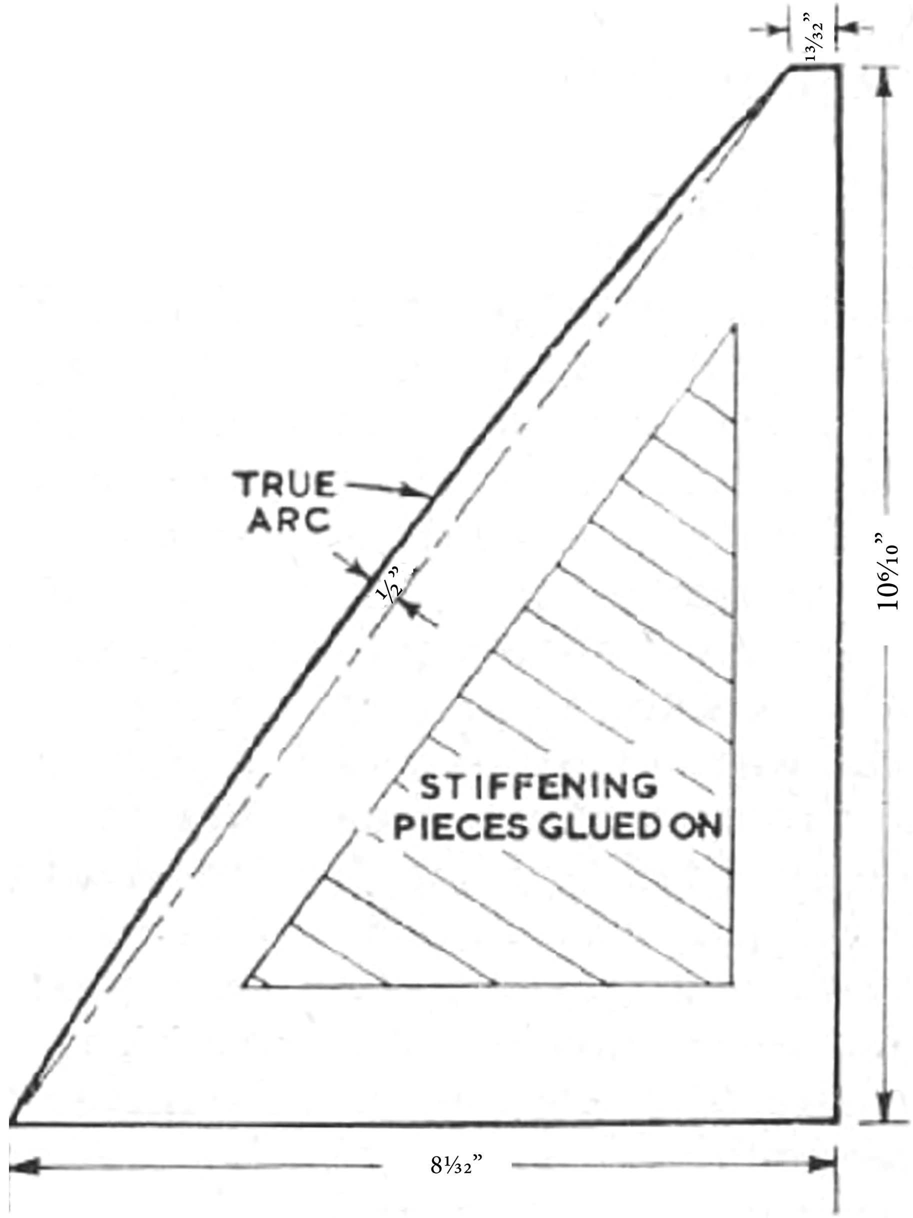



Fig. 3. SHOWING HALF-PLAN OF DUMMY SOUNDBOARD. The curve is a true arc, there being a curve outwards of 4 inch at the central point.

# Part 3

**The Sound Chamber** — Instead of using an elaborate mould such as is employed by the violin or guitar maker, I build the balalaika body on a "dummy" soundboard cut out of 3⁄16 in. plywood. The baseboard, side linings and shoulder block are all attached to this by screws from the outside (see Fig. 4) so that the dummy may be discarded when the body shell has been made. Cut the plywood to the dimensions shown in Fig. 3 and glue a couple of stiffening pieces about ¼ in. thick on the side which will be inside the sound chamber. The baseboard shown in Fig. 1 is cut from a piece of straight-grained pine or spruce similar to that selected for the belly, but not necessarily quarter-sawn. It should be fully marked out and cut with a certain amount of waste as shown by the shaded areas in the illustration.

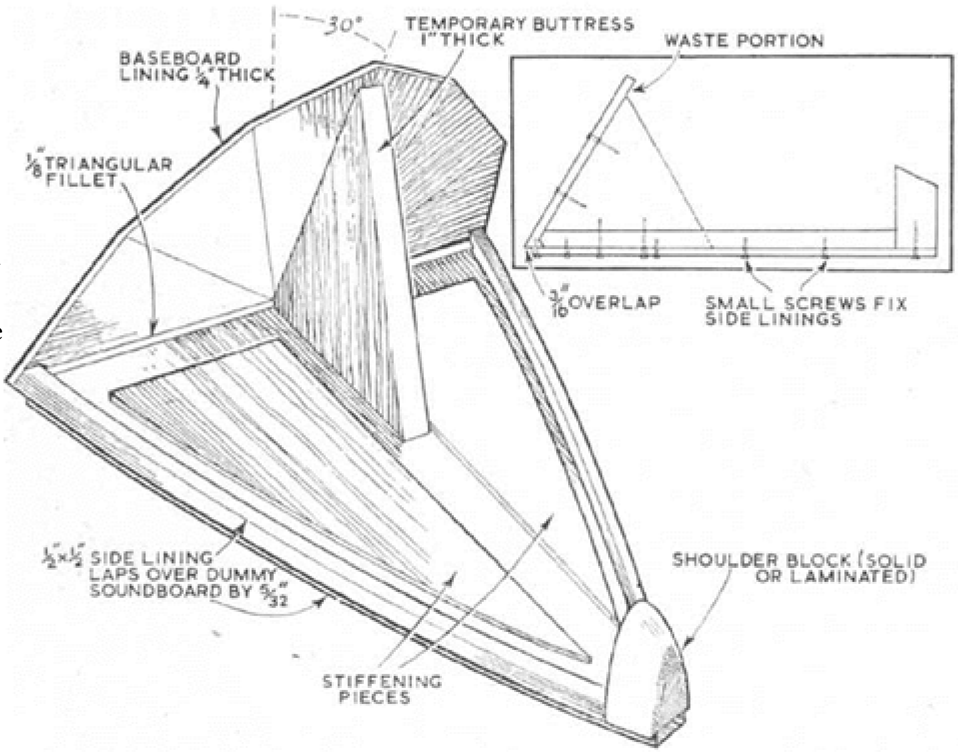



Fig. 4. COMPLETED ASSEMBLY READY FOR SUBSEQUENT BUILDING. The inset shows side elevation.

The baseboard is screwed to the dummy at an angle of 60 degrees and is best planed to this angle before it is cut to shape. The ⅛ in. triangular fillet may be planed at the same time to ensure accuracy, having been glued in place beforehand. When fixed, the baseboard should overlap the plywood soundboard by about 3⁄16 in. along its length It will also slightly overlap at each end. To increase stability during construction, a 1 in. thick buttress is screwed into a central position as shown in Fig. 4.

The shoulder block may be cut out of a single piece of pine or spruce, or may be built-up as a laminated piece. It should be 1 in. thick and its surface, which is screwed to the dummy, may be shaped by drawing a line 5⁄32 in. outside each edge of the plywood. The narrow end of this block should be shaped as indicated in Fig. 2, face (A), but the final shaping of the remainder left until later. Face (B), Fig. 2, only gives a general idea of the shape and it is as well to leave plenty of waste at this stage. When the block has been secured in place with two screws it should be flush with the end of the dummy, and overlapping each side by 5⁄32 in. Incidentally, a small drill such as an Archimedean drill is invaluable in these screwing operations.

You now come to the first of your bending operations —namely, bending the side linings and this will be dealt with in the next article. In the meantime, it will be necessary to contrive some controlled-heating device. I can recommend the type of bending iron such as I made for this kind of work, which is shown in Fig. 5. It consists of a piece of 1½ in. diameter copper tube about 12 in. long, mounted on four legs which are formed by bending two pieces of mild steel strip, about 18 in. by ½ in. by ⅛ in. each, in the centre. The feet are then screwed to a baseboard, and heat is supplied by a gas poker inserted in the tube.

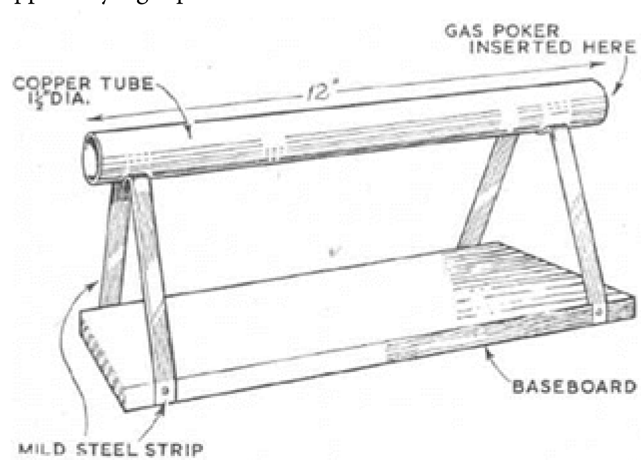
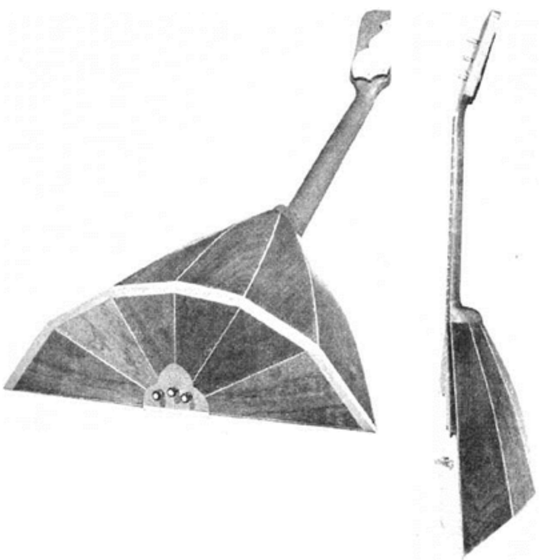



Fig. 5. AN EASILY MADE AND EFFECTIVE BENDING IRON

For the side linings prepare 2 pieces of straight-grained pine ½ in. square and, after soaking them in water for about 5 minutes, bend them on the iron to the curve of the dummy sides. Bend them with the grain parallel to the surface of the iron and apply steady pressure close to the point of contact, moving the wood to avoid scorching until all the moisture has evaporated and the necessary curve obtained. The linings are then cut to length to fit snugly in place between the baseboard and shoulder block, and secured with small screws through the plywood. They will overlap $\frac{5}{32}$ in. to match up with the baseboard and shoulder block. As the linings will need to be shaped on the outside to take the slant of the ribs, care must also be taken to ensure that the screws are short enough to be clear of the chisel.

The back ribs. Your next task is to prepare the three pairs of back ribs (Rl, R2, and R3) as in Fig. 3— note that a pair is one right- and one left-hand piece. Prepare the ribs as suggested in Part 2, bearing in mind that much of the art of the luthier lies in the ability to know the qualities of wood and to “feel” the ideal thickness as he contrasts the hardwood parts against the belly material. In the hardest of material the ribs should not be less than 2 mm. thick.



Figs. 1 (left) AND 2 (right). VIEWS OF THE INSTRUMENT SHOWING THE GRACEFUL LINES OF THE CURVES

Preparation of these thin pieces of wood calls for considerable patience, but with the right methods you will find it is not difficult. Planing cannot be done against a bench stop so the pieces must be clamped to the bench at each end in turn, and worked away from the clamps. When you are near the right thickness, I suggest you use a simple home-made tool described in the next paragraph, followed by an ordinary scraper and glasspaper.

The tool referred to above is a toothed scraper made by embedding a fine-toothed hacksaw blade into a sawcut made in a block of hardwood so that only the teeth protrude. The block could be 2 in. by 1 in. and the same length as the piece of blade. This scraper is invaluable for preparing ribs or soundboards, and by varying its angle across the work you will be surprised at its efficacy.

When cutting out the ribs, allow about ¾ in. to spare at each end and sufficient waste on the outers to trim level with the side linings after assembly. After studying Figs. 1 and 2, cut out some rib shapes in cardboard and bend them into their respective places, in conjunction with Fig 3. You will find this a help in shaping the side linings and baseboard edges to take the ribs. First, shape the shoulder block where the outer rib (R1) will be fitted, and lay the cardboard shape in place from time to time as you cut away the surplus wood gradually to make a good fit. Then cut the angles on the baseboard ends and shape the rib linings.

The two outer ribs are fitted first and they should be placed in water for at least 10 minutes before bending. The iron should be hot enough to cause “spitting” when in contact with drops of water. The curves shown in Fig. 3 will give you a nice shape and body depth but some makers fashion the ribs somewhat straighter. With all other things perfect, the deeper body will give the instrument much more volume.

When you are ready to fit the outer ribs, the work must be fixed to a stout board by 2 screws through the reinforced part of the dummy (Fig. 4). The board must have some inches of space all round the assembly and into it should be fixed a row of partly-driven screws about in. from each side of the dummy. When the outer ribs are glued in place they will be held by softwood wedges behind each screw.

To hold the ends of the ribs in place, a screw may be set in face (A) of the shoulder block and in the face of the baseboard. These are used as fastenings for loops of string under which wedges are placed on the outside of the ribs.

The whole assembly is illustrated in Fig. 4.

# SHAPES OF RIBS SET OUT IN SQUARES

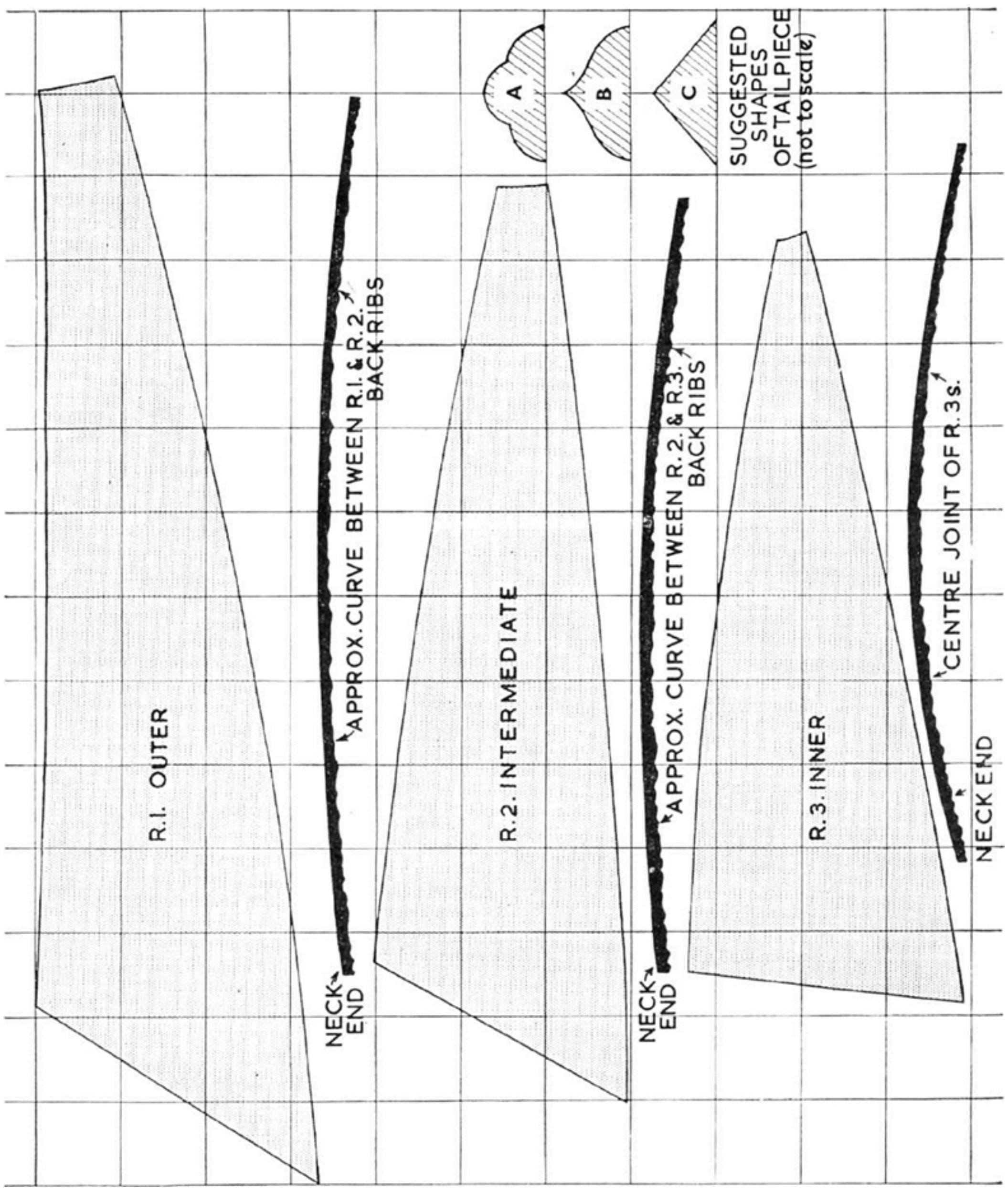



Fig. 3. GIVING SHAPES OF THE BACK RIBS, AND ALSO THE APPROXIMATE CURVES OF THE BACK RIBS. THE DRAWING IS SQUARED-OFF, EACH SQUARE REPRESENTING ONE INCH (Inset) Some suggestions for the shape of the decorative tail piece

For this part of the work I recommend “Cascamite” or a similar water-resistant glue.

When the first pair of ribs have set, the ends must be cut off flush with a line-toothed saw and the angles prepared for the intermediates, (R2). You will find that these and the inner ribs (R3), have a pronounced twist toward the narrow end and their shaping requires considerable patience. Before the next ribs are fitted, a contrasting strip of veneer is glued to the inner edge of the rib already in place. Then the other rib pairs follow singly, and during the gluing process are held in place by pieces of string attached to screws on each side of the assembly and the careful insertion of wedges as necessary. Obviously, the holding screws which are put in the base linings will have to be moved with each successive rib. The ends must be cut off as each rib is secured or you will have complications with the sawing angles. Remember to unscrew the assembly from its fixing on the board before finally fitting the inner pair of ribs. To hold them during gluing operations string may be wound round the whole shell.

**The base ribs** —These are perfectly flat and should be cut out as shown in Fig. 1 (Part 2). At their wide ends they are cut about ¼ in. shorter than the diagram outline to allow a rebate for fitting the protective edging where the rib ends meet (see Fig. 1). At the other ends they are shaped for the fitting of the decorative tail-piece into which the string pins are housed. The longer pair of ribs must be cut to fit proud of the base lining edge to compensate for the angle of the base and to allow for trimming.

The tail piece may be to your own design, but should preferably be done in simple curves (see Fig. 3 inset). It must be of a very hard wood. Make it also, if you can, of a wood which contrasts well with the ribs. Ebony and rosewood go well with sycamore. If it is not attractive to look at, then cover it with a contrasting veneer, as I have done with lace wood on the instrument in Fig. 1. Those ribs are of walnut and the tail measures 2 in. by 1¾ in. I think the most effective designs are a plain semi-circle or shallow triangle shape.

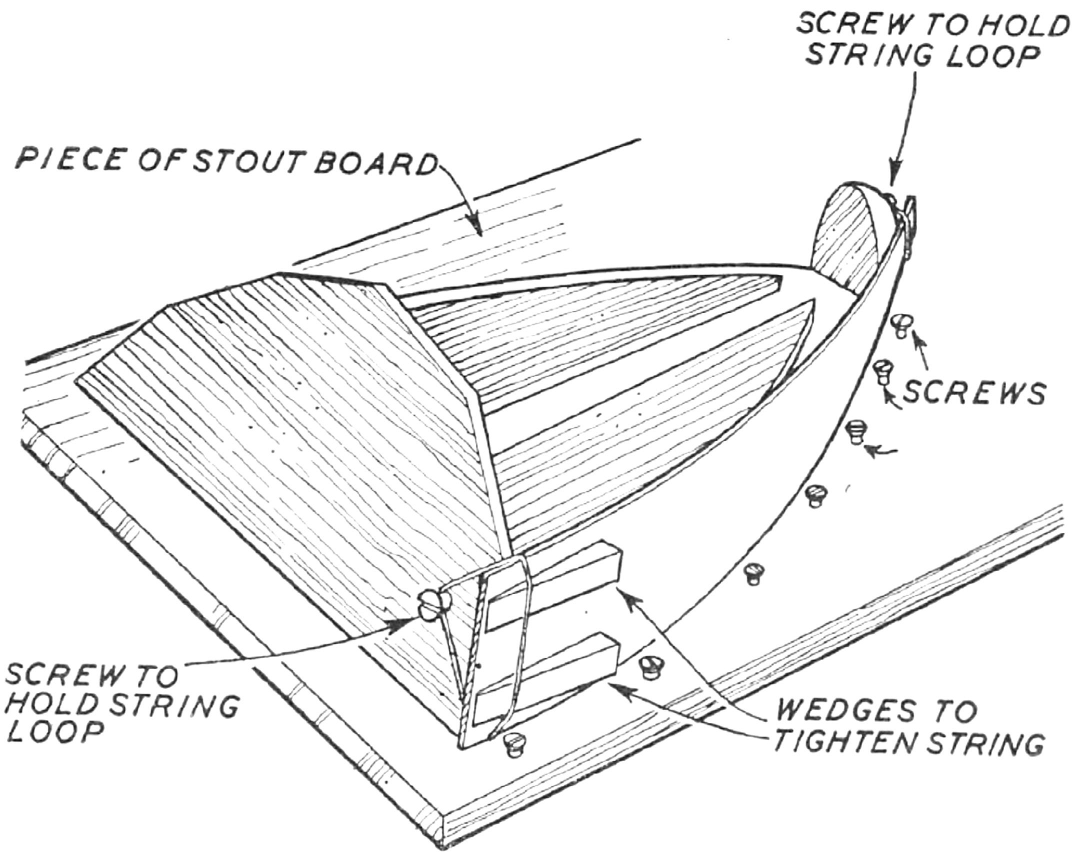



FIG. 4. FITTING THE BACK RIBS. Note that the assembly is screwed to a stout piece of board.

At this stage you should unscrew the dummy soundboard and the buttress from the linings and the base ribs are glued in place with the aid of “G” cramps. Between the ribs will be placed pieces of contrasting veneer as was done with the back of the instrument.

# *Part 4*

Your balalaika is now taking shape but much remains to be done before it is a musical instrument, and for the remaining operations you must take precautions to protect it from blemishes which would spoil the finished article. To avoid marks on the fine surfaces and edges, particularly of the softwood belly, cover your bench with a thick piece of old blanket or similar material.

When the base ribs have been fitted, you will need six pieces of hardwood to form the protective edge at the junction where base and back ribs meet (see Fig. 3, B). For this you may use the same material from which the ribs are made or a hard contrasting wood in keeping with the decorative veneer lines of the back. If the former is chosen, the appearance of the instrument is enhanced by further strips of veneer glued on to the back and base rib ends before the fillets are put in place.

Using a water-resistant glue at the central point on the inside of the base-lining, behind the tail-piece, fix a piece of hardwood cut as shown in Fig. 1 (A). Its straight side should fit up to the triangular fillet and it is best made of a hard—but not brittle—wood with close grain. Beech or American maple may be taken as examples.

The side linings may next be shaped to the section shown in Fig. 1 (B) and all the inside surfaces cleaned up with glass- paper to a smooth finish.

Some balalaika makers have fitted very thin strips of hardwood along the rib joints inside the shell. This, of course, calls for a lot of care in shaping, bending and gluing, but is not necessary if your joints have been correctly made with a glue which will resist the damp.

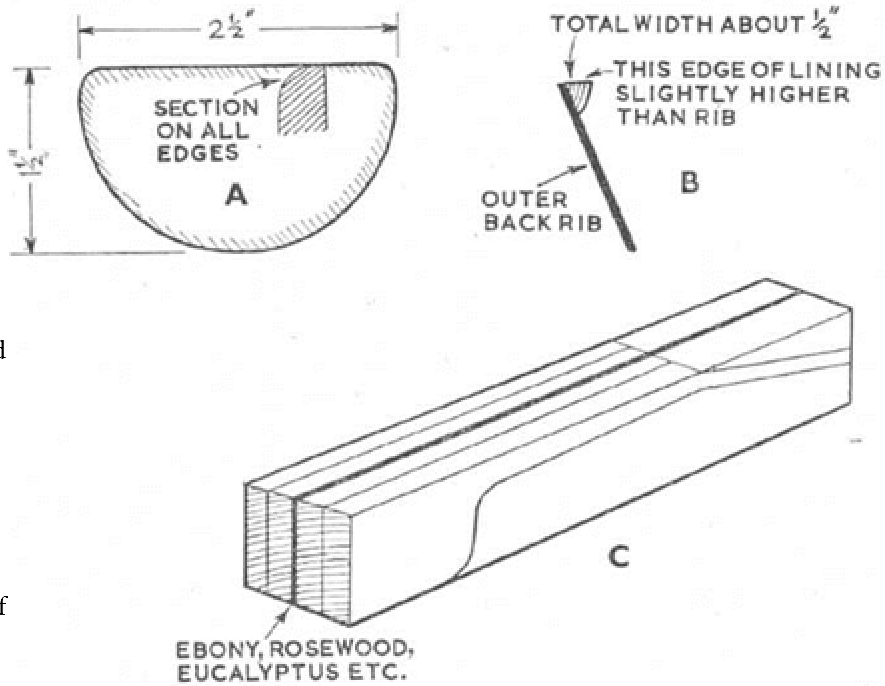



FIG. 1. (A) SHOWS DETAILS OF THE INTERNAL TAIL BLOCK, ⅜ IN. THICK. A sectional view at (B) gives the final shape of the side linings, whilst (C) shows a laminated neck marked out ready for shaping.

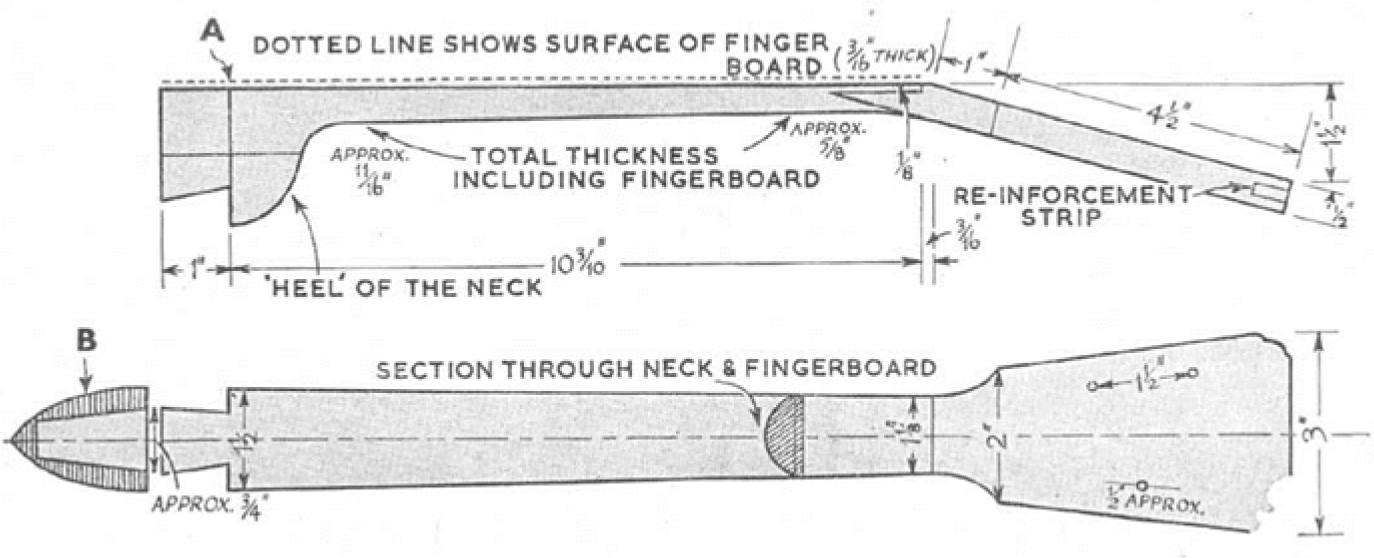



Fig. 2. SIDE ELEVATION AND PLAN OF NECK AND FINGERBOARD. Note reinforcement strip.

**The head and neck** — At this stage you should obtain the machines which are to be used on the head of the balalaika as they must be fitted during the construction of the neck unit. The instrument shown in Part 1 of this series has the traditional type of one-piece machine which has the string-barrels fitted on a single back-plate. To give the diagonal slant of the barrels the turn-button rods are of different lengths. This pattern of machine is no longer available—at least not in this country—but there are others which are equally good and, in fact, I prefer the type illustrated in Fig. 4. It is the single unit vertical type machine and you will need two left-hand and one right-hand units. They can be obtained in sets of three with three tail-piece pins to take the other ends of the strings.

It is most important that when the machines are fitted the cogs of the string barrels must be below—on the body side—the worm gears so that string tension keeps the teeth in constant contact.

Describing the various materials required, in Part I, I referred to my preference for necks to be constructed of solid rosewood and Fig. 2 shows the method when using this or similar strong woods. With your material still in "the square" cut the vee-joint and glue the head piece and neck together with the glue already specified. Then, at the opposite end, glue on the underside of the neck sufficient of the same material to make up the depth of the "heel" to coincide with the shape of your sound-chamber, bearing in mind that the thickness of the sound-board, which will be flush with the neck face, must be allowed for. At this end of the neck it is a good idea to leave a few inches of spare stuff to put in the vice during shaping operations.

The reinforcing piece through the head of the instrument is not standard, but I have used it when the head has been a single piece of walnut, mahogany, or the like. Before the head is cut to shape the slot is made with a fine-toothed saw and channeled out from each side in turn with an ⅛ in. chisel. The reinforcing strip should be hard and strong with the grain running across the head.

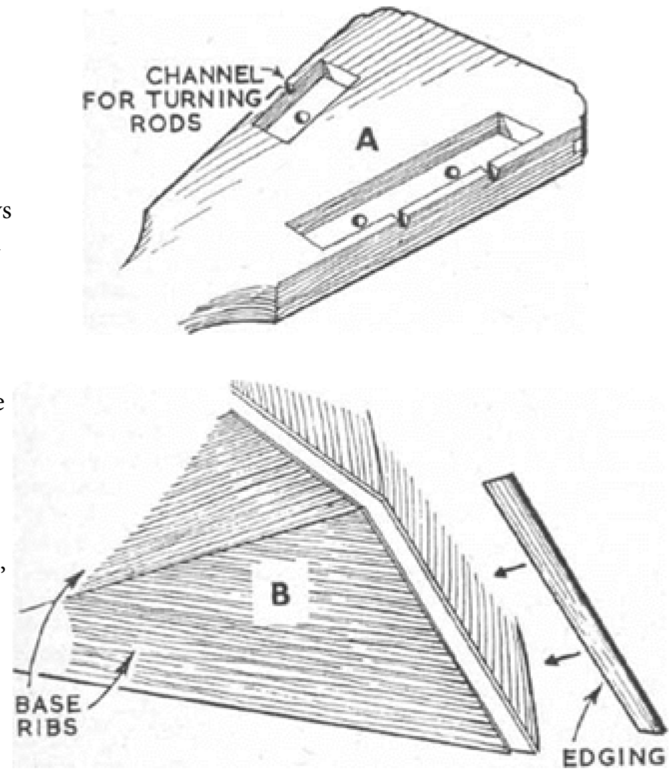


Fig. 3. METHOD OF RECESSING HEAD TO TAKE THE MACHINES IS SHOWN AT (A)
How the protective edging is fitted at junction of back and base ribs is illustrated at (B)

When the neck and head have been securely glued the shape can be marked out in pencil. Draw, first of all, a centre line along the head and neck and, with the aid of a cardboard template, put in the outlines. The template is a half-plan of the head and used on both sides to ensure symmetry. The head shape shown is a traditional pattern but you may wish to design your own. If you do so keep the lines simple and avoid any elaborate ornament which may be easily damaged. The head is now cut to shape with a fret-saw and the face only of the neck cut to within a fraction of its proper width.

The decoration on the head of the balalaika seen in Part I is inlaid and a refinement not usually seen on continental instruments. Unless it is done with taste and care it may spoil an otherwise nice instrument, so use your discretion.

The "heel" end of the neck is still in block form and you must now make a right-angled cut with a fine saw on each side of the neck at the line (A), Fig. 2. Then shape the heel as shown in side elevation and section (A) and (B), Fig. 2, being governed by the body shape at the shoulder block. As the right-angle cut of the neck will be modified slightly to offset the neck-face from the sound-board, final shaping of the heel cannot be done at this stage. The lines of the heel and the curving junction of head and neck should be delicately rounded to flow into the lines of the neck as shown in section, but it is essential that the neck itself is not shaped until after the finger-board has been fitted.

Fig. 1 (C) illustrates how a laminated type of neck is made with a strong centre core of the hardwoods already mentioned. Although the gluing operation in this method is simple you will have considerable work with, first of all, the bow-saw and later the rasp, or spoke-shave. A well laminated neck gives the necessary strength, and the strip of dark-coloured wood provides a pleasant stripe along the neck. If materials do not permit otherwise you may laminate the neck only, and join on a solid head as shown in Fig. 2, but when the laminate runs throughout, the head should be faced with about 2 mm. or so of suitable hardwood for appearance and lateral stability.

The machines already described may be screwed flush on to the back of the instrument head but it is far more satisfactory to fit them into recesses as shown in Fig. 3 (A). This is in the manner of the best solo instruments and the gears are afterwards sealed-off by a special cover—the making of which I shall describe later—which keeps out dirt and ensures easy running of the parts. The neatness of this arrangement may be seen in Fig. 1 of Part III.

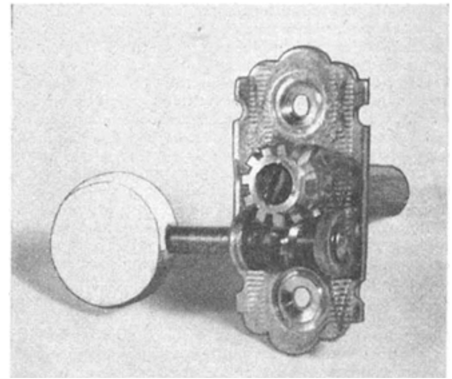


Fig. 4. A "machine" of the single unit type.

First of all mark the positions of the string-barrels on the face of the head, making sure that the turn-buttons have sufficient clearance for free movement, and bore clean holes for them from the face side. You will then be able to put the barrels in the holes at the back and mark around the holding plates where the recesses will have to be cut. This countersinking must leave about ¼ in. thickness of wood to which the machines are screwed. When the machines are fitted there should be no harsh chafing of the movable parts when the buttons are turned. The machines described have string barrels about 1 in. long which means they will protrude something like ¾ in. after fitting in the recesses. This is too long for neatness so, if they are of unplated metal they should have the ends sawn off with a fine metal-cutting saw to reduce them to approximately ¾ in. In doing this, make sure that the saw-cut is not too near to the string-hole bored through the barrel. Afterwards the barrels should have the ends filed to a dome shape and smoothed off with emery-cloth, etc.

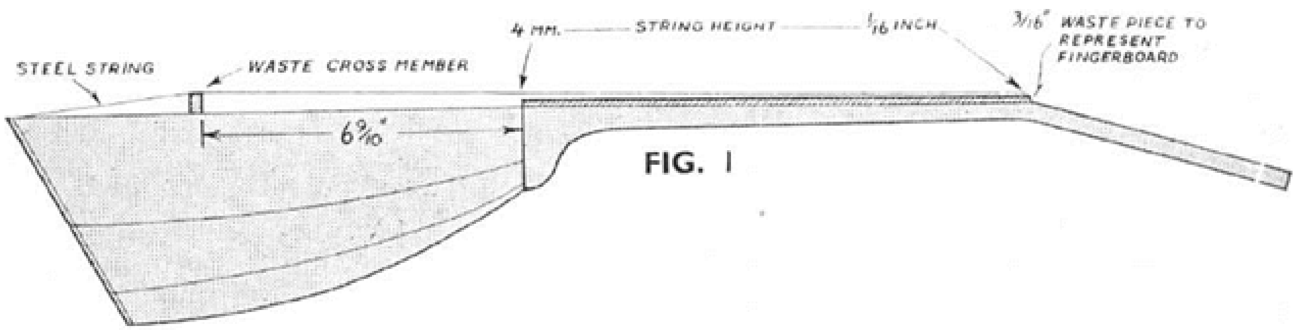
# *Part 5*

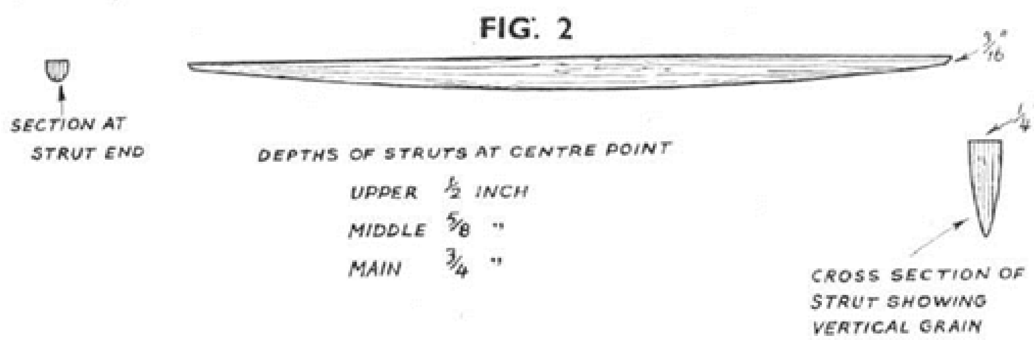
When fitting the neck, the surfaces of the fingerboard and soundboard of the balalaika do not run in the same plane as in a Spanish guitar. In other words, the neck of the instrument is inclined slightly backwards at the head end as may be seen in Fig. 2, Part 3. This setting of the neck has a profound influence on the final character and response of the instrument, and its adjustment cannot be over-emphasised.

Obviously, no exact measurements can be given for these operations as such factors as soundboard thickness and curvature have to be taken into consideration. You should aim to have strings which play easily at all frets, being clear of the fingerboard by about 1/16 in. at the "nut" (head end) and by approximately 4 mm. at the 16th fret, the latter being at the junction of the neck and body. Have a bridge height not less than ½ in.: I have seen bridges of up to ¾ in., but I make mine around 7/10 in.

First of all, cut a piece of straight waste stuff 3/16 in. thick and exactly 10 3/10 in. long. Attach it lightly, with a couple of dabs of animal glue, to the neck face where the fingerboard will be fitted. The width of this may be less than that of the neck but its surface must be straight, with the end exactly at the point (A) of Fig. 2, Part 4. Now, allowing about 2 mm. for soundboard thickness, about ⅛ in. for curvature and 7/10 in. for the height of the bridge, cut another piece of waste material and temporarily attach it across the open top of the body at the bridge position. To obtain this position, working from a centre line on the shoulder block and the tail piece, draw a horizontal line on the side linings 6 9/10 in. from the end of the shoulder block, measured down the centre of the sound chamber. This attachment is best cut from ½ in. material and should be lightly glued on edge up to the horizontal line on the lower side of the body. Its upper edge should give you the approximate position of the bridge contact points and enable you to set the neck at the proper angle with the aid of a thin metal string (see Fig. 1).

First you must cut the rather unorthodox dovetail on the neck unit and mark the shoulder block from it. The corresponding socket is then cut through the block with a dovetail saw and carefully chiselled out. The angle at point (A), Fig. 1, Part 4, is cut back gradually towards the tip of the heel in conjunction with the dovetail joint, until the correct neck setting is found. Remember that the face of the neck and the soundboard will be level at the point where they meet, and the dovetail must be cut down flush with the upper edge of the body after it is glued in place. Final gluing in position is done with the same adhesives as already mentioned.




Measurement from point (A) to upper side of struts; upper 2¾ in.; middle 5 3/10 in.; main 7 6/10 in.

Fig 1. Setting the neck. Fig 2. The cross struts.

At this stage, the bridge guide cross-piece should be left in place and a pencil mark made on it centrally at the height where you have estimated the soundboard surface will be. The mark should be on the lower side of the body.

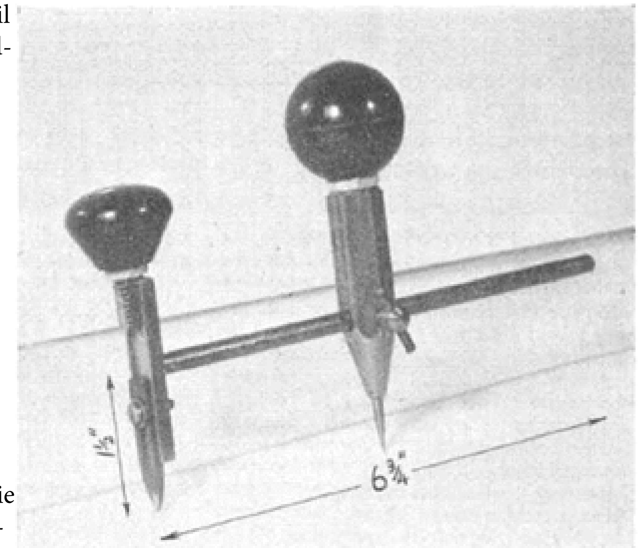



Fig. 3. HOME-MADE ROTATING CUTTER
When making only a single instrument, a similar tool could be made up in wood. The cutters may be arranged with a spacer between them, and the pointed centre pin can be slid along the round bar to give any desired diameter

**Strutting** —To support the soundboard, three struts of selected pine or spruce, if possible from the same material as the belly, are fitted across the body into recesses cut into the side-lining upper edges. The underside of these cross members is shaped before gluing into position, but the upper edges are left square, being given the final curves when the belly is ready to fit. The grain in the struts must run vertically as shown in Fig. 2.

**Making the soundboard** —The belly pieces (see Part 1) are joined edge-to-edge after truing up on the shooting-board, and glued together with Cascamite or a similar colourless, water-resistant adhesive. The joints must be perfect. If more than two pieces of wood are used—that is, not the specially matched halves—care must be taken to ensure that the fibres of each piece lie in the same direction to avoid planing difficulties. Thicknessing of this component was dealt with in Part 2, but you will find it even more exacting than preparation of the ribs because of the frailty of the softwood. Your planing bench must be quite fiat and a piece of lath (or similar material) placed over the belly-piece under the holding down clamps to avoid splitting the work. In this operation your hacksaw-blade tool will really prove its worth.

The soundhole should be made before the belly is cut to its final shape and may vary between ¾ in. and 1 in. in diameter. The hole will be edged with a ring of contrasting hardwood and the width of this must be taken into consideration when the aperture is cut. The best tool for this operation is a rotating cutter such as the home-made one shown in Fig. 3, but a good job may be done with a fretsaw followed by glasspaper held round a suitable piece of large dowel. The cutter is necessary if you wish to inlay rings of decorative "purfling" around the soundhole. Purfling consists of thin strips of black, or black and white veneers and is obtained from violin shops. On small soundboards such as the prima balalaika it is better to confine the central decoration to a hardwood edging. Having then decided on the soundhole diameter, mark its centre point on the belly so that its lower edge will be ¼ in. above the middle strut. Then cut out a circular hole some ¾ in. to ½ in. greater in diameter than the finished soundhole and glue inside it a disc of your chosen hardwood. When the glue is set, cut the final hole in the hardwood and round off its edges.

In view of its origin it is not surprising that the balalaika has often been decorated with legendary and peasant motifs. I have seen some old instruments in which the head was shaped like that of a horse—that animal being dear to the heart of the old Cossacks. Others have had either painted or inlaid designs featuring birds or animals, but the most popular style of all has been such instruments as that shown in Fig. 4.

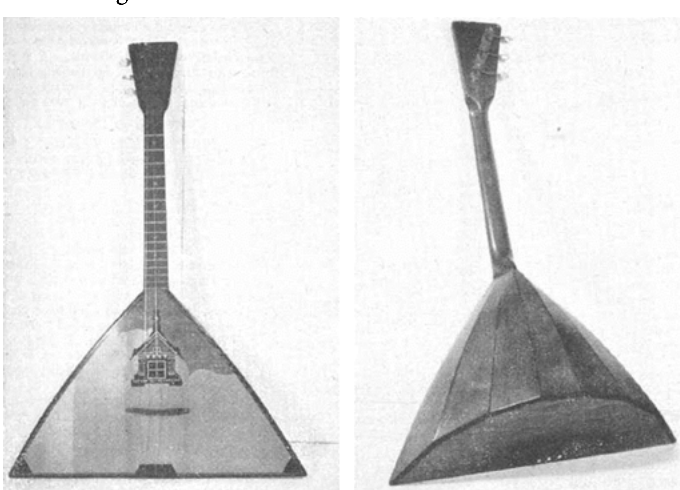


Fig. 4. FRONT AND BACK VIEWS OF BALALAIKA BY OGLOBLIN.
Note decoration of soundhole.

This balalaika, by the Russian maker Ogloblin, has the fingerplate and centre decoration inlaid in contrasting veneers and the sound holes are the windows of the traditional *dacha* or little country house. The window bars have little strips of pine reinforcement glued on the inside of the belly.

**Fitting the soundboard** —The supporting struts should now be given their final curves, the lower or main one being shaped first to a centre height suggested by the pencil mark on the waste piece. The strut will, of course, be the thickness of the soundboard lower than the mark. Now take oft the guide piece and shape the two upper struts with slightly more curve on the centre one than the others. The surfaces of the struts must run in line and to obtain congruity it is a good plan to bend a thin lath over them as they are pared down.

At this point you may wish to fashion a maker's label and glue it inside the body underneath the soundhole position. The usual details are the name, place and date.

The soundboard is cut to shape so that when fitted it will have a rebate of about $\frac{5}{16}$ in. on its three sides. Here will be fitted the protective edging. The lower corners of the belly are decorated with pieces of contrasting veneers, etc., and this may be done either before or after the part is fixed. Simple designs with strongly contrasting woods are most effective.

The soundboard should be given a final light rub-over with flour grade glasspaper on the inside and glued into position with hot, thin animal glue. For this holding- down process, like the native Spanish guitar makers, I use yards and yards of string.

# *Part 6*

**The body edging** — The protective binding should be applied to the rebated edges as soon as the sound board glue is set, and for this the same adhesive is used. The most vulnerable part of the instrument is the belly and, if it should need repair or replacement at any time, it is important that its glue may be easily softened with a thin-bladed knife dipped in hot water, to facilitate removal. This also applies to the edging and is the reason for using a thin violin-makers' glue.

Obviously the edges of the body are best made from a hard-wearing wood and one which enhances the appearance of the instrument. It may be dark or light in colour but should be chosen in harmony with the other parts. Such choices as rosewood, ebony and boxwood are the best, but beech, sycamore and walnut are quite suitable.

Between the soundboard and the edging are glued, on edge, thin strips of contrasting veneers or violin-makers' purfling and these, like the binding, are mitred at the corners (see Fig. 1). As the soundboard is light-coloured, the veneer next to it should be dark with succeeding strips in alternate shades. The binding is best cut from good, straight-grained wood and curved on the bending iron.

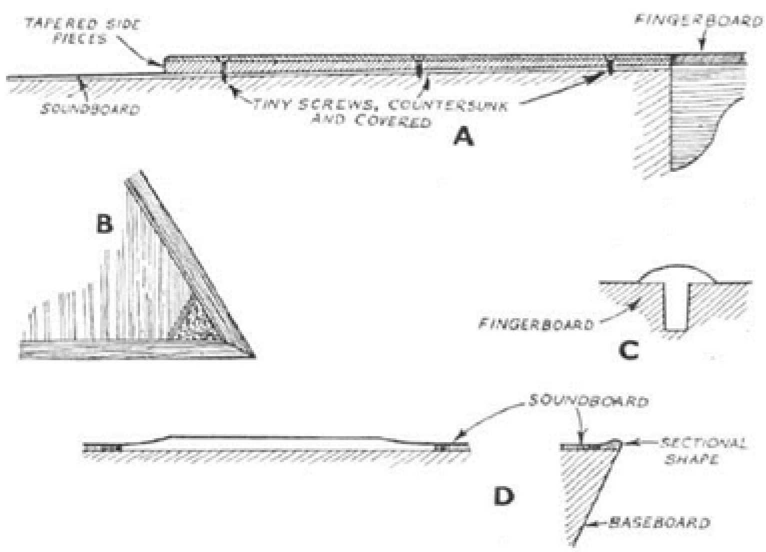


Fig. 1 (A). SECTIONAL VIEW OF FIXING OF FINGERPLATE TO BODY (B) DETAIL OF CORNER DECORATION SHOWING VENEER LINES AND BINDING OF EDGES (C) CROSS-SECTION OF FRET WIRE (D) IVORY, BONE OR PLASTIC FITTING TO TAKE STRING PRESSURE ON LOWER EDGE.

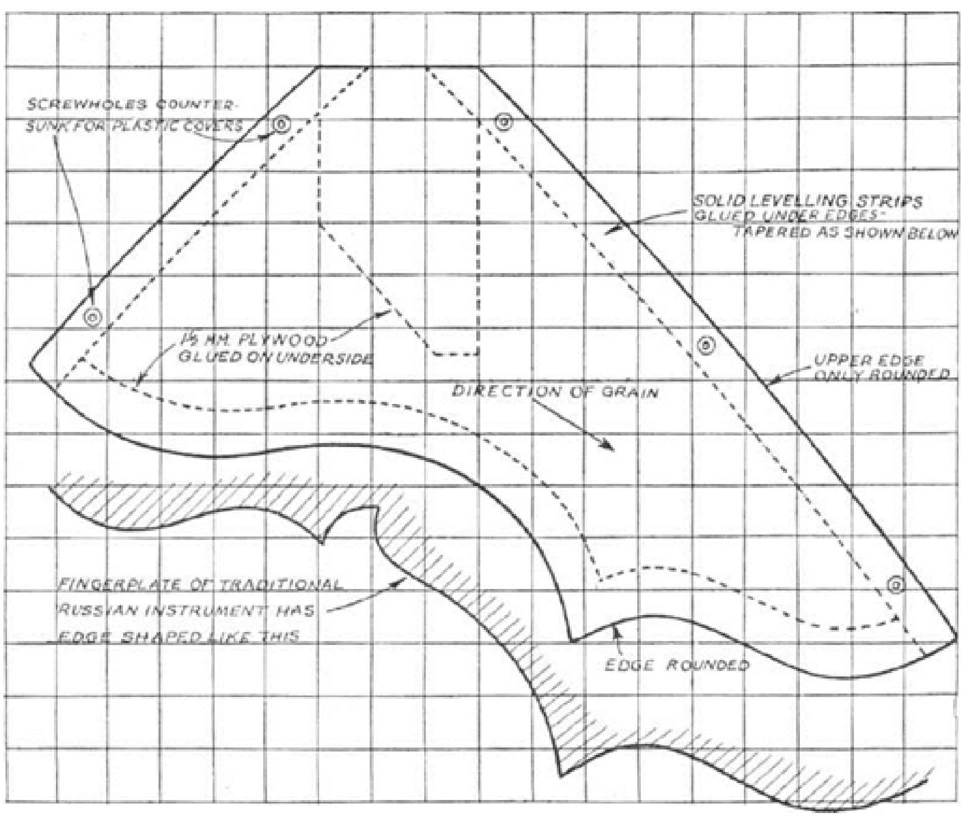


Fig. 2. PLAN OF FINGERPLATE WITH ALTERNATIVE SHAPED EDGES. Squared-off to represent half-inch squares.

The binding of the base edge is done in two parts, a gap of some 3 in. — or the width of the decorative tail-piece in the baseboard — being left in the centre. This space is filled by a piece of ivory, bone or hard white plastic which takes the pressure of the strings (see Fig. 1 and Part 1, Fig. 2). It is cut to shape with a fine-toothed saw, filed and glasspapered but need not be glued in place until after the instrument is given its final polish. At the same time the binding edges are gently rounded off with glasspaper.

**The Fingerboard** — In Part 2 I described the necessary materials for the fingerboard and fingerplate (or guard) and a study of Fig. 2, Part 1, will give you some idea of how these pieces are used. The neck part of the fingerboard is separate from the remainder, which is merely an extension of the frets which are set in the surface of the fingerplate. Fret No. 16 is set at the joint between the two parts. Generally, orchestral balalaikas are not fretted beyond this point, only solo instruments having twenty-four frets.

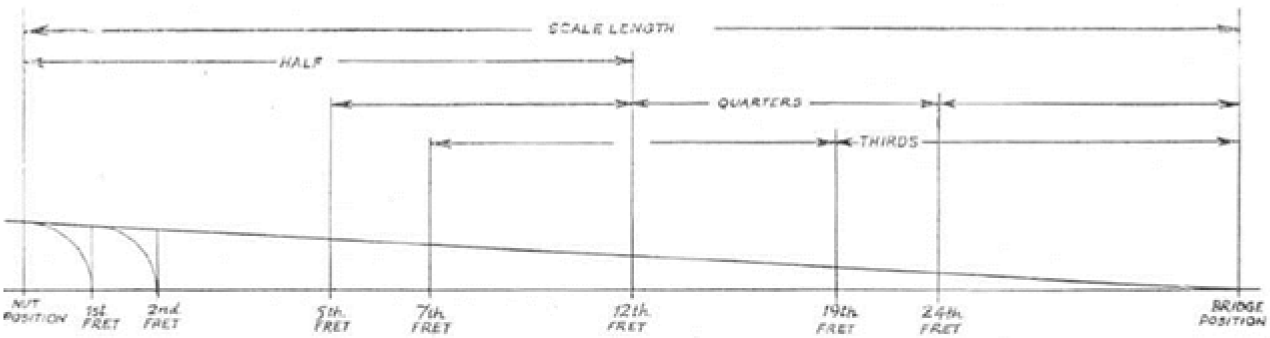



Fig. 3. METHOD OF PLACING AND CHECKING FRET POSITIONS.

| Fret No. | is half-way between No. | and the Bridge |
|---|---|---|
| 19 | 7 | |
| 12 | 7 | 19th |
| 20 | 8 | Bridge |
| 13 | 8 | 20th |
| 21 | 9 | Bridge |
| 14 | 9 | 21st |
| 22 | 10 | Bridge |
| 15 | 10 | 22nd |
| 23 | 11 | Bridge |
| 16 | 11 | 23rd |
| 24 | 12 | Bridge |

| Fret | No. | 13 | is | half-way | between | No. | 1 | and the | Bridge |
|---|---|---|---|---|---|---|---|---|---|
| | | 6 | | | | | 1 | | 13th |
| | | 14 | | | | | 2 | | Bridge |
| | | 7 | | | | | 2 | | 14th |
| | | 15 | | | | | 3 | | Bridge |
| | | 8 | | | | | 3 | | 15th |
| | | 16 | | | | | 4 | | Bridge |
| | | 9 | | | | | 4 | | 16th |
| | | 17 | | | | | 5 | | Bridge |
| | | 10 | | | | | 5 | | 17th |
| | | 18 | | | | | 6 | | Bridge |
| | | 11 | | | | | 6 | | 18th |

In order to get the fret positions at right-angles to a centre line of the fingerboard, they must be marked with a set square and fine, steel scriber before the board is cut to its tapered, final shape and glued on to the neck. First of all you will need a template, preferably a fiat strip of soft metal, on which the positions can be marked. Fig. 3 shows a method of finding the intervals which will save much time in calculation, but its success must depend on the accurate placing of the first fret. Mark the places tentatively in pencil before you check to prove their accuracy.

There are various methods used to determine the tonal frequencies of a fretted instrument and, in recent years, the subject has aroused considerable interest and research.

Take the scale length of 17.2 in.—that is, the distance between the string contact points at nut and bridge— and divide by 17.835. The answer is the distance from the nut to the first fret. By repeating this process all the frets may be positioned but so much mathematical calculation is avoided if you follow Fig. 3. Some makers divide the scale by 89 and multiply the answer by 5 to obtain the fret positions.

The 12th fret is exactly half-way between nut and bridge; the 5th and 24th frets are at the quarter divisions; the 7th and 19th at the positions of equal thirds of the scale. The total length of any five frets should be the same as the following seven frets; e.g. from the nut to the 5th fret is the same distance as from the 5th to the 12th.

When the fingerboard has been marked and tapered to fit the neck it should be glued in place with hot, thin Scotch glue. Its wider end should be at the point where body and neck meet, but provided all your other measurements are accurate, a slight variation does not matter as long as it does not interfere with the fretting and the fitting of the fingerboard and finger guard. Cold, dense woods such as ebony should be warmed before the glue is applied to avoid faulty adhesion through chilling.

**The Fingerplate** —This should now be made as shown in Figs. 1 and 2 with supporting side-pieces to raise it in line with the fingerboard when it is fitted, the edges being flush with the body. Apart from the plywood reinforcements, this component is made entirely of the selected hardwood as specified in Part 2 and the grain should run as shown. This point is important, to minimise the danger of splitting when the frets are being inset. The supporting pieces will, of course, have the grain running along their length

When the fingerplate is completed it should be temporarily screwed in place, flush up to the end of the fingerboard, and the remainder of the twenty-four fret positions marked on it from the template. At the holding positions on the fingerplate edges, shallow holes are bored with a sharp drill of about 3⁄16 in. diameter.

This provides the recess for the little "caps" which are placed over the screws, the latter being tiny steel ones sufficiently long to enter the soundboard edging. The actual screw holes are completed with a fret-work drill and slightly countersunk. On good Russian balalaikas the screw covers and the position marks of the fingerboard were made of mother-of-pearl, but I use ivory or a similar substitute. Small discs cut from white knitting needles are ideal.

**Fretting** — The technique of playing the balalaika calls for a lot of sliding of the left hand so the frets must be low and fairly flat. Only "T" section fret wire is suitable and the standard pattern, made of nickel or German silver, supplied for Spanish guitar making, is admirable. The old type square-topped fret-wire is useless.

Before the frets are fitted you must put in the playing "position" marks of the fingerboard which are situated at (on the head side of) the 2nd, 5th, 7th, 10th and 12th fret positions (see Part 1, Fig. 2). Shallow holes are bored into the fingerboard with a clean-cutting hand drill and pieces of white knitting needles, very slightly tapered, are tapped in tight. They are cut off close with a fine-toothed saw and filed down before finishing off smooth with fine glasspaper.

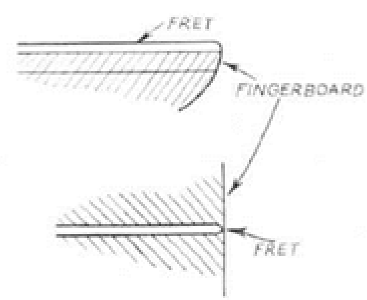


Fig. 4. How fret ends are rounded.

I use a piercing saw to cut off the lengths of fret-wire. Each is cut to the exact width of the finger board and the ends rounded smoothly before fitting into carefully-made saw cuts. The frets must fit tight with the upper section hard down on the fingerboard surface, and it is usual to "burr" the sunken part with the edge of an old file before they are tapped in. Two or three light blows with the file across the wire give sufficient "bite" to hold the frets in place.

Considerable care is needed to put the frets into the finger plate, which must be removed first, as their seatings have "blind" ends. The simplest way is by cutting slots for them through the finger plate before the plywood backing piece is glued on. This is easily done by drilling tiny holes at the end of each fret position and from them making cuts of the required lengths with a fairly coarse fretsaw*. As you will see in Part 1, Fig. 2, the lengths of the frets diminish from number 18 onwards, the last one being a mere ½ in. in length and operative under the first string only. The last fret to be fitted is the 16th, and this must obviously be left until the finger plate has been finally screwed in place.

Testing of the fret surfaces is done with a steel straight-edge and any slight prominences may be rubbed down with a fine, flat file. To ensure uniform rounding the file should also be passed lightly lengthwise along the fret ends, without coming into contact with the fingerboard, and followed with fine emery cloth.

# *Part 7 (Conclusion)*

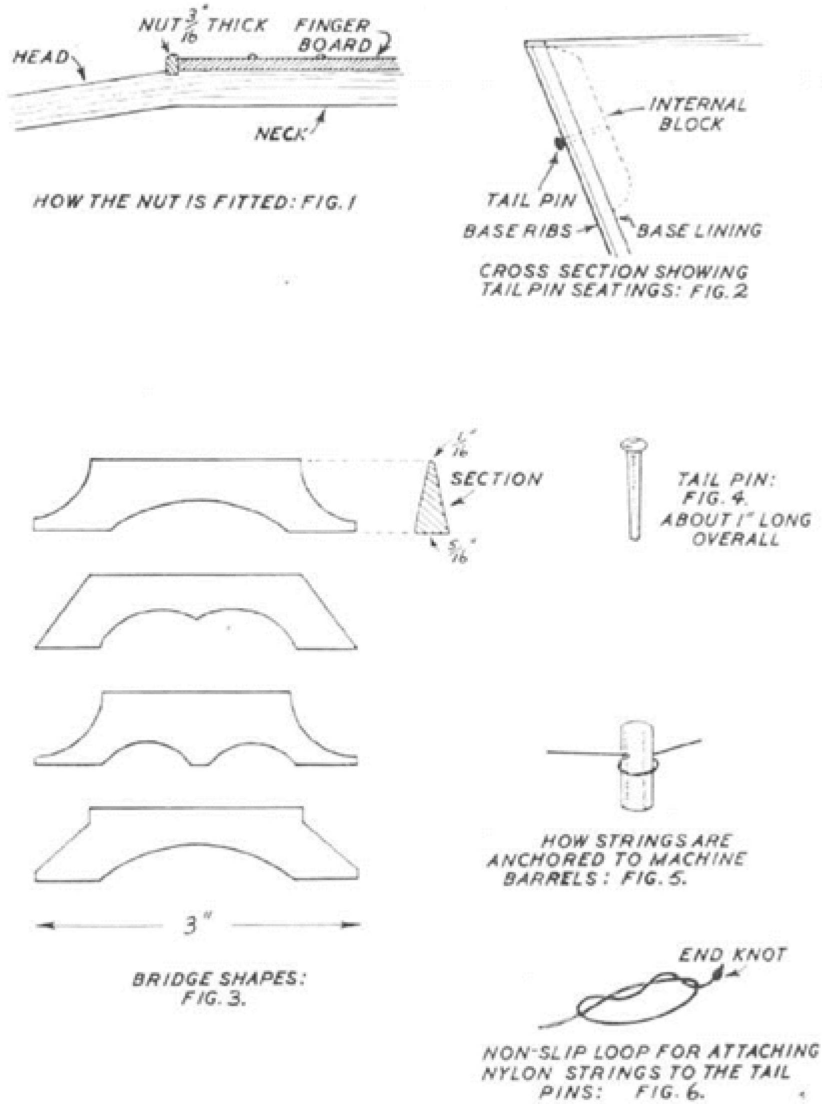
As explained in Part 4, the neck of the balalaika is finally shaped after the fingerboard has been completed and then you should fix the "nut" over which the strings pass from the head. The nut is best made of ivory or bone, but a plastic material of similar quality would make a good substitute. It is glued into a slight recess at the end of the fingerboard (see Fig. 1) and should be sufficiently high to raise the strings about $\frac{1}{16}$ in. above the fingerboard when they are bedded into their shallow grooves in the nut. The grooves are made after the nut is fitted and before the raw edges of the upper nut are rounded with fine glasspaper.

**The machine cover plate** —This component may be made of various materials, but the silver, engraved plates of the old Russian instruments have been replaced by plastics. It may be made in one piece or fashioned, as I prefer, with a thin sheet of xylonite over a thicker piece of ebonite (see Fig. 7). The black and white make a pleasant contrast and match up with the other fittings recommended. These materials are shaped with a fret saw and files before being finally polished to a glossy surface with fine emery powder and oil applied vigorously with a linen pad. The two-piece construction is a simple matter as holes for the machine parts can be cut out of the ebonite and the xylonite glued on afterwards. The outer shape is cut last.

If the turn-button rods of the machines are slightly "proud" of the head, corresponding grooves will have to be made in the edges of the cover plate. To do this use a fine, rat-tail file.

**The tail pins** —You will require 3 tail-pins made of ebony or ivory in the shape shown in Fig. 4. The one illustrated is a Spanish guitar bridge-pin made of ebony, with a mother-of-pearl inlay in the head, and these are excellent for the purpose. The pins must fit tightly into holes bored through the decorative tail-piece into the internal reinforcing block (Fig. 2).The outer pins must be situated to hold the strings in a line a little more than $\frac{1}{8}$ in. from, and parallel to, the edges of the fingerboard. They should be not less than $\frac{3}{4}$ in. from the edge of the baseboard. The centre pin may be slightly offset, according to taste, but all of them should enter the baseboard at right angles to its surface.

**The bridge** —The bridge of the balalaika is a "loose" component, being held in place by the pressure of the strings, and it is therefore easily replaced when the string seatings become worn. Although I generally prefer it to be made of rosewood, you could experiment with various close-grained woods like those referred to in Part 2. There are many designs to choose from, all of them being of the "open" type—that is with cut-away portions underneath (see Fig. 3). You may vary these cut-out shapes according to the woods you use on the principle that the harder woods may have more cut away than maple, etc.




Figs. 1 TO 6. AN EXPLANATION IS GIVEN WITH EACH ILLUSTRATION.