REPAIRING

THE

REED ORGAN

AND

HARMONIUM

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The Organ Literature Foundation
Braintree, Mass. 02184

This book is an unabridged republication of the original and is available from:

The Organ Literature Foundation
Braintree, Mass. 02184

Price $2.50 postpaid.

ISBN 0-913746-06-1

Repairing the Reed Organ and Harmonium

ONE of the greatest difficulties which confronts the average tuner is the repair of organs and of harmoniums; and it too frequently happens that a tuner discovers that he has a handful of screws to spare after attempting to deal with some defect in a reed instrument. That organ repairing forms a large part of the tuner's work is proved by the number of advertisers who require a tuner "well up in organs;" and, although it is not possible for a tuner to become an efficient repairer simply by reading articles, it is possible to point out the best way of doing the principal jobs which are to be met with and thus to some extent to lighten the labours of the tuner's hands and brain. Therefore I venture to think that some words on this subject may prove useful to many of the "willing to learn" brigade.

THE AMERICAN ORGAN.

BELLOWS WORK.

Commencing then with the American organ, I will endeavour to set forth clearly the troubles to which this instrument is heir; and afterwards to deal with its worsted rival, the harmonium. The most useful tool to have in your bag when on organ work is the screwdriver and it is advisable to have three or four sizes and patterns: organ makers find such odd little corners for their screws! One fault with the bellows which greatly puzzles many tuners is when an organ cannot be blown properly, though apparently the bellows are in good order. In Fig. 1 is shown the side view of part of the bellows as applied to American organs. No doubt most of you are aware that the bellows of the reed organ exhaust the air from the air chest and this is done by means of the exhauster and the two valves (A and B). Now it sometimes happens that the inner valve (B) becomes curled and does not close properly; and the consequence is that when the exhauster has been filled with air extracted from the reservoir

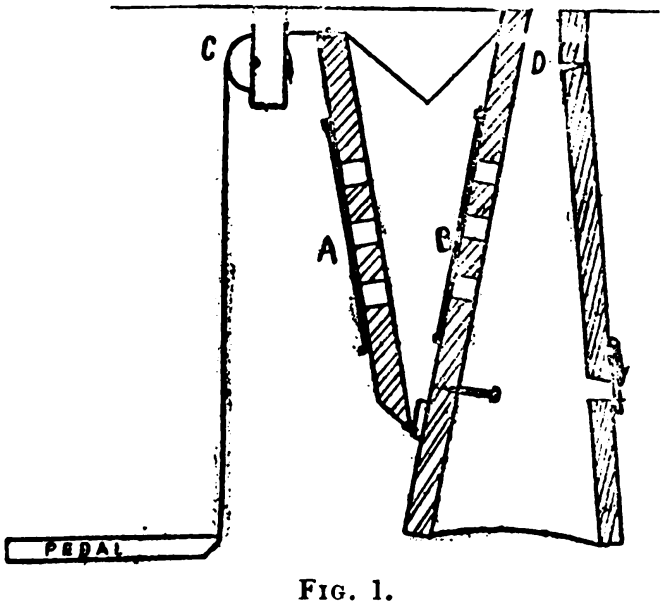


FIG. 1.

the air, instead of being expelled through the valve A, returns to the reservoir, thereby nullifying the work which has been done by the exhauster. If the pedals are depressed carefully, this fault can be detected by noting whether there is more pull on the pedal than can be accounted for by the spring. Supposing the valve to have curled, there is nothing for it but to remove the whole bellows and strip the rubber cloth from around the exhauster, when it can be lifted up and the defective valve replaced. Often the outer valve (A) does not close properly, when there is also a loss of power; but this valve is more easily accessible.

American organs are now generally constructed with a removable panel in the front of the case; and this is a great time saver when some small matter requires attention, though many of the panels that I have met with are so swollen with damp as to be immovable. When the tuner finds this state of things he might think strong language, but for the fact that he is usually in church at the time. It is possible sometimes to knock in the centre panel with your fist, when you will have a good chance of obtaining a strong hold on the surrounding frame and thus of removing the panel; but, in doing this, see that your elbows are not too near the wall!

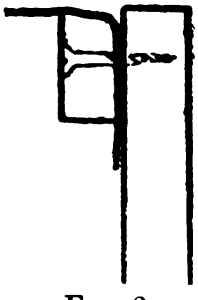


FIG. 2.

The squeaking noise which often accompanies the playing of the organ mostly arises from the pin which passes through the roller (C) becoming dry. This pin is easily removed and it should be greased with a mixture of tallow and blacklead. The webbing which connects the pedals with the exhausters will occasionally break and it is possible to fix new webbing on from the front. When the organ is made, the webbing is fixed to the top of the exhauster; but in renewing the webbing it is not always convenient to fix it on the top, so a good plan is to make it fast by screwing a small block near the top of the exhauster and passing the screws through the webbing (see Fig. 2). If the bellows wil not hold wind (or perhaps it would be more correct to say main-

tain a vacuum), they will most likely require recovering; but it would be well to make quite sure that the bellows are at fault and to do this properly the whole bellows must be removed and some paper or leather placed over the apertures shown at D (Fig. 1).

Before you can arrive at this air passage, the air chest or upper part of the organ must be removed, when a row of holes or two long slits will be exposed. On each side of these holes will be observed the screws which secure the air chest to the bellows. Air will sometimes leak in at this joint and cause the bellows to act badly; so give it some attention when reassembling these parts. If the bellows have to be recovered, which is rarely required, the best plan is to follow closely the method used by the makers in fitting the original rubber cloth. By passing a damp cloth round the edges of the bellows and applying a warm iron, it is an easy matter to strip off the old rubber cloth and this makes an excellent pattern for cutting the new cloth. Assuming that the bellows are in good order, we will consider some of the difficulties to be met with in the action.

CYPHERING.

Cyphering often provides work for the tuner, so we will next investigate the several causes of this fault. Starting with the key, we must first ascertain that this is quite free and not binding on either of the pins nor against the next key. The keys being made of soft wood are very liable to warp, so it is sometimes necessary to take a little off the side of the key with a thumb plane. Before the keys can be removed the stop action must be disconnected and placed somewhere out of the way.

In some makes of organs the stop action is hinged at the back and on withdrawing a screw at either end the action may be simply pushed up in a vertical position without being separated from the case; in others, the key blocks must be removed first and then each stop disconnected at both ends of the organ. The keys on their frame may now be taken out, the key frame being generally secured by screws and by a brass catch in the centre. When the key frame refuses to come away, it will be necessary to remove the two middle keys and withdraw a screw which will be found hidden underneath them.

Directly under the keys will be found the plungers (or push

pins) and it is usually these plungers that are responsible for most of the cyphering, through their becoming tight in the holes which are made in the cavity board. The remedy is to glasspaper the rod down; and, if the building in which the organ is placed is very damp, it is a good plan to make the plungers quite free and afterwards to blacklead them. The best method of doing this is to roll the rod in some powdered blacklead and rub the lead in with the fingers or a piece of rag. It is not always desirable to remove the whole set of keys in order to attend to one plunger; but if one or two keys only are required off the frame, the slip of wood at the back of the frame (called the back catch) must first be unscrewed.

In the case of an organ containing a coupler, should the offending note be one of the coupled it is nearly always necessary to take out the set of keys because the coupler collar will prevent the plunger being drawn out; and, anyway, I think that the keys are best out of the way. Having now attended to the plunger and supposing the organ still cyphers, the next thing to be done will be to remove the top of the air chest and see what it is that is causing the trouble. The probability is that the reed valve or pallet has been pushed out of its place: perhaps by a hard blow on the key, or the spring pressing on the valve has become weak or broken. In the sketch Fig. 3 I have shown the side section of the action of an American organ and one of the screws which secure the top of the air chest (also called the soundboard) to the bottom; and I have thought it advisable to label each portion with what is no doubt partly my own nomenclature, because I have found that in different parts of the country various names are used to designate the several sections, so the sketch will make for clearness. We shall require the withdrawal of all the screws round the air chest, and in some organs the front row of screws will be found under the air chest and once this is opened it is an easy matter to cure the cyphering.

I have now dealt with the main causes of cyphering; and among others which only need to be mentioned are the reed valve warped, dirt on the reed valve or the stop-board pressing slightly on one (or more) of the keys. Should a valve require recovering through the old leather having become hard and curled, have the glue fairly thick and apply it just along the centre of the valve, avoiding any excess of glue which would be likely to spread to the edges of the valve and make the leather hard.

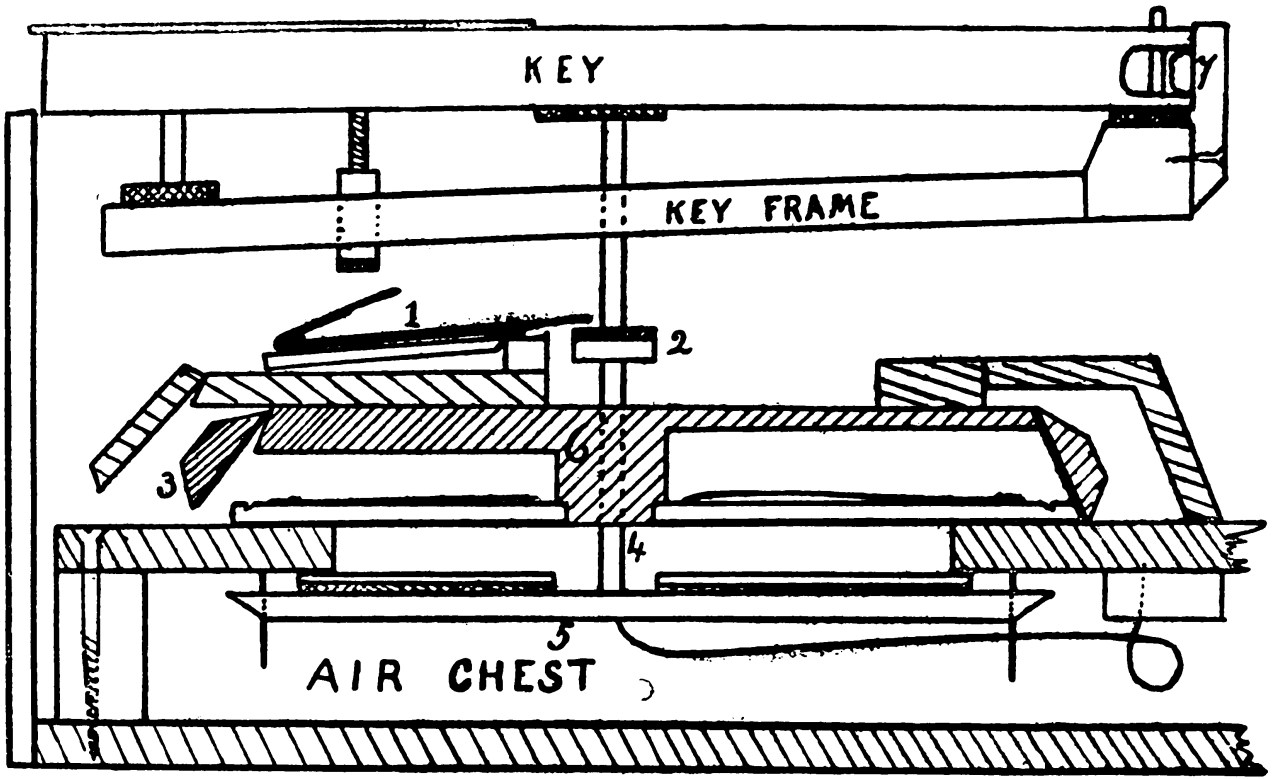


FIG. 3.

(1) Coupler Action. (2) Coupler Collar. (3) Stop Valve. (4) Plunger. (5) Pallet or Reed Valve. (6) Cavity Board. (7) Back Catch.

WHISTLING NOTES.

One of the most troublesome things to deal with in a reed organ is a stop valve which will not close properly when the stop is pushed in, thereby causing a whistling sound on some of the notes. This is more noticeable at the treble end, where the small reeds require only a small leakage of air to make them speak. The springs on the stop valves, as most tuners are aware, consist of straight pieces of brass wire with the ends bent in opposite

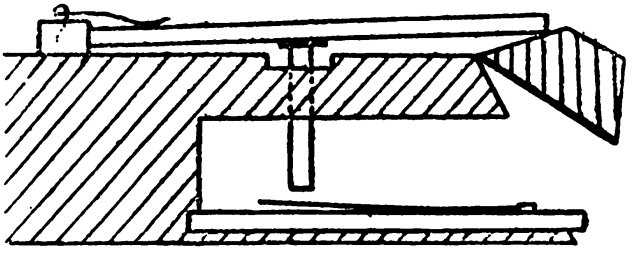


FIG. 4.

directions, one end being inserted in the valve and the other end in the cavity board. If the spring has broken, the remedy is at once apparent; but, in fixing a new spring or in shortening an old one to strengthen it, observe that you do not force in the cavity-board end, just where a reed comes: it must always enter the board on one of the divisions. The valve itself may be warped and the remedy here is to remove the valve, strip off the leather and plane the valve perfectly straight. If the valve has warped but slightly, sometimes an additional spring may be inserted with good effect.

On many organs there is a device for preventing the small reeds sounding when the valve has been closed and a sketch of this arrangement is shown in Fig. 4. The small wooden plunger is allowed to drop on the reed when the valve is down or shut, thus effectually preventing the reed from sounding. These small plungers are liable to stick owing to damp and consequently to be put out of action. The remedy is obvious.

One plan which may be resorted to in order to prevent notes sounding when they are not wanted to do so is to "bleed" the reed cell. This is done by allowing an escape for the small amount of air which filters through the valve. There are two methods of "bleeding," one consisting of boring a hole—say, with a bradawl—through the back of the reed cell to communicate with

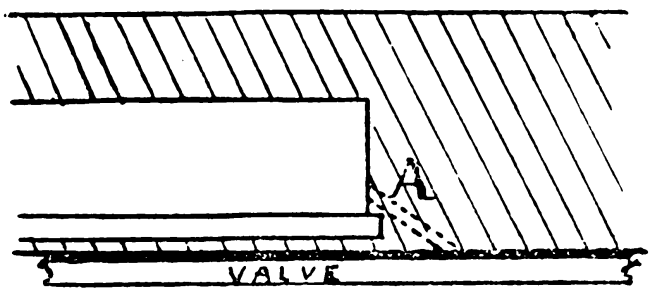


FIG. 5.

the valve. This is shown in Fig. 5 at A, where part of the reed cell is shown, the dotted lines representing the "bleed hole." The other method, which is preferable, is to drill a small hole through the reed block just in front of the free end of the reed; but tuners are not always provided with a drill when working outdoors and some may prefer to file a nick in the side of the reed block with a saw file.

RUNNING NOTES.

If the notes of an organ run one into the other, this is an indication that the cavity-board has become unglued from the sound-board: in such a case, it will be necessary to have the instrument removed to the workshop. All the reeds must be withdrawn and laid aside on a board; and, should there be two or three rows of reeds, it will save trouble later if a mark is placed on the board beside each row to show whether the reeds have been taken from the back or the front of the organ. The plungers, reed valves and all loose parts must also be removed; and the sound-board should be placed solidly on some support, such as a couple of thick boards.

Now, if this is a bad case being treated, it will be possible to separate the cavity board from the sound-board with the aid of a knife and chisel; but the work must proceed slowly and with great caution or you will chip pieces out of the cavity board and give yourself some amount of extra work or perhaps ruin the board altogether. The next thing to be done is to scrape off all the old glue from both portions of the work, the surfaces being afterwards warmed in readiness for the gluing. To proceed with this operation, first see that the boards underneath are perfectly flat and bed well on to the sound-board. The sketch Fig. 6 will show how to place the boards and the handscrews. In making this gluing, remember to have everything as warm as possible:

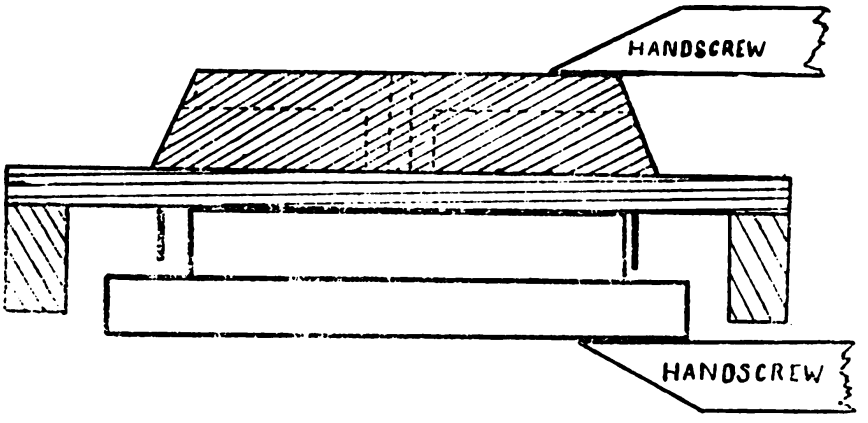


FIG. 6.

the shop must be warm and likewise the two surfaces to be glued and the board next to the sound-board, while the glue must be boiling hot and not too thick.

When the two portions of the work are brought together, the pressure of the hand-screws is very liable to make them slide out of their places; consequently, a small dowel should be fitted at either end before commencing to apply the glue, or a screw would do if the holes were previously bored. Cover the top cramping board with a sheet of paper, so that if any glue should run down through the valve holes it will not cause the sound-board and the cramping board to stick fast together. If your workshop is equipped with a press, the gluing could of course be done with its aid, though personally I think that the handscrews are the more satisfactory.

The running of the notes may be observed in only a few notes, in which case it would be possible to glue down a part of the cavity board without entirely removing it from the sound-board; but the valves, &c., should all be removed. After the glue has been run in with the aid of a thin piece of metal, the hand-screws must be applied as I have already described. The whole of this work requires very careful handling, as the cavity board is rather delicate. When applying the glue, take care that it does not flow into the slot which the reed occupies. The work should stand for at least twelve hours, after which it may be cleaned up and the reeds and valves replaced.

VOX HUMANA STOP.

We will now pass to the vox humana stop, which sometimes requires a little attention and some grease. The fan of the vox humana is turned by a wind-wheel, which is contained in a small box at one end of the fan. When in action, a current of air is made to pass through the box and so to turn the wheel. Dampness will occasionally cause the wooden projections on the wheel to swell and consequently to stick against the sides of the box. In such cases one side of the box must be removed and a small portion of the side of the wheel cut away. If the motor is fitted with a valve in the air chest, this valve may not open sufficiently to start the fan working; while, if the fan continues to revolve when the stop is pushed in, it is evident that the valve has not closed properly, which may be due to the valve spring having become weak or to the plunger which operates the valve having become tight in the hole. Blacklead mixed with tallow is best to use as a lubricant for the fan bearings; with the exercise of a

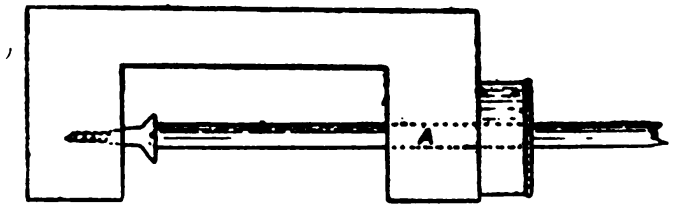


FIG. 7.

little patience, this admixture can generally be worked in sufficiently to silence any noise. It is not advisable to use oil, as this causes the wood to swell and is at the best a very temporary remedy.

I think that I have now dealt with the chief repairs to a reed organ with the exception of the reeds and tuning. Before writing a few words on this branch of the subject, I should like to describe the method of adding a coupler to an organ which has been turned out into the world without this useful adjunct. Though not strictly repairing, we all know that any second hand will sell more quickly if it has a coupler; besides, does it not mean the addition of two more stops?

COUPLERS.

There are two couplers in use,—to couple up or to couple up and down. Either of these may be drawn on with one stop or divided to make the two stops. When there is no sub-bass in the organ, it is better to use the up and down coupler; but, should a sub-bass be found in the instrument, the all-up coupler will be the more suitable. The coupler to be used having been decided upon (and they may be purchased from any of the supply houses), the keys must be removed with the key frame and the coupler placed approximately in the position it will occupy. If the organ is fitted with a front swell which rises at the top, this must be cut into two at the angle, the top part being made a fixture and the swell made to open at the front only. This course is necessary in order to prevent the swell bringing on the couplers. The plungers which are to be coupled will require to have a coupler collar glued on at the point where the metal levers work. In order to glue on all the collars in a line, a block of wood is used (shaped as shown in Fig. 7) and fitted with a screw so that the correct distance can be gauged to a nicety. The plunger is inserted in the hole in the block at A and allowed to rest on the

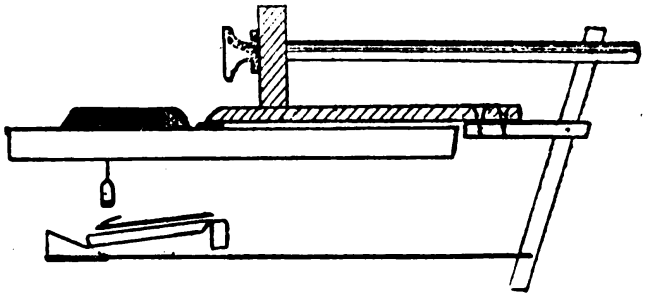


FIG. 8.

screw head. A touch of glue should be placed on the plunger and the collar pushed up to the block. The sketch will make this clear, the collar being shown in its place. When the collars have all been fixed and the coupler screwed in its place, the next thing to be done is to readjust the key-frame, as it will most probably be found necessary to bring the keys forward slightly in order to allow room for the coupler buttons which are to be screwed in the keys. Do not alter the key-frame more than is absolutely necessary to clear the buttons. Next put in a screw at either

end to mark the position. The position of the coupler buttons is determined, of course, by the coupler itself, the buttons being made to depress the end of the coupler. It will now be seen that the keys require another piece of cloth where they bear on the plungers and the new cloth will require to be slightly thicker than the old, in order to preserve the same depth of touch. Now comes the work of fitting the stop connections and here it is that a little ingenuity is required. One of the simplest methods of bringing the coupler into action is by means of the wedge and lever shown at Fig. 8. It will be seen that, when the stop is drawn, the wedge is pulled under the coupler board, thereby raising it into action.

I might mention that it is possible to fit a sub-bass or a vox humana with profit. The stop knob of the vox humana is generally placed in the centre of the stop-board; but when adding this stop it is quite likely that, owing to the lack of space in the centre, the stop knob will have to be placed to one end. When this is done, a double lever or a crank must be provided to carry the movement of the stop to the centre.

TUNING.

Now, the last thing to be done in the repair is the tuning. There is no need for me to dwell on such matters as laying the bearings and obtaining pure octaves; but a few hints on the actual work of bringing the instrument into tune will, I know, prove useful.

The first thing to consider is what tools to use; and chief among them I would place a small knife of good quality steel, which must be kept sharp throughout the whole time that the organ is being tuned. A small file with a safe edge is also very useful and many tuners use a steel scraper; but, personally, I have found nothing to equal the knife. If you can find a knife with a blade made of steel that will bite easily on the brass without quickly losing its edge, count it as the most valuable tool in your possession and guard it well. I have tried many knives for organ tuning and found the majority of them guilty. A small flat piece of steel (part of a watch spring will do) is useful for inserting between the tongue of the reed and the block whilst tuning. This is practically all that will be required.

An organ which sounds very badly out of tune when all the

stops are drawn may on examination be found to contain only one row of reeds which is really bad, and this will be either the two or the four foot set. The small reeds always go out of tune sooner than the large ones and they usually go flat owing to the accumulation of dust on the tongue of the reed. If the small reeds are removed and brushed with a stiff brush, it will be found to bring them partially if not quite into tune.

When commencing to tune, always lay the scale on the diapason or 8ft. set of reeds; the other rows are tuned from this, but in fine tuning each row and scale must be tested by itself. It is important too that the bellows should be at about half pressure while the tuning operation is proceeding. Scraping or filing at the free end will sharpen the reed; to flatten, the heel or fixed end must be filed. Care is necessary in withdrawing or replacing a reed with the reed hook that the sides of the reed cell are not damaged. The tongue of a reed should fit the aperture in the block as closely as possible without actually touching the sides The more accurate the fit, the prompter in speech will the reed be, but it will also be inclined to be thin in tone; whereas a reed which has plenty of room will be slower in speaking, but softer and rounder in tone. To obtain roundness of tone, the reeds on some of the stops are given a twist lengthwise in addition to the curve at the end of the tongue. This twisting and curving is called voicing and it is hardly necessary to say that the voicing should in no way be altered.

I was almost repeating that great care is necessary; but any sensible tuner will know that, in tuning delicate things like small organ reeds, it is no use filing away the brass as if the supply of metal was unlimited. Too much care cannot be taken when filing or scraping reeds; as the metal, once removed, cannot be replaced and loss of metal means loss of tone. I know that some tuners find a difficulty, when tuning octaves, in deciding whether a reed is slightly flat or sharp; and to these the following "tip" will be appreciated. If one key is allowed to slowly rise, the alteration in the rate of the sound waves will indicate immediately in which direction the reed is to be tuned, as the note will become temporarily flat as the key rises. For instance, supposing the top reed of an octave is slightly sharp; then, on allowing the upper key to rise gently, the octave will be observed to come into tune, showing that the top reed requires flattening. This method of determining the state of the reed is especially valuable in the

case of the small reeds, where a wrong diagnosis may mean a spoilt reed.

I know the theorist will say that a tuner should be able to tell whether a reed is flat or sharp by trying the fourth and fifth; but those tuners who are not too clever are liable to make a mistake when it comes to the top octave of a two foot set. When one set of reeds is being tuned to another, the same plan may be followed; only, in this case, the stop connected with one row would be slowly pushed in, which would have the effect of flattening this particular row. A large reed will sometimes make a jarring sound owing to its fitting too tight in the reed cell, which has the effect of pressing in the sides of the reed block against the tongue. The remedy is to file the outside of the block; there is no need to tamper with the tongue of the reed. A reed which has suddenly gone flat will be found to contain a flaw or crack; so it is no use tuning it, as it will quickly go out of tune again or perhaps break off. A gentle pressure on the reed will soon reveal any defect of this description.

These few remarks on the tuning of the reeds apply equally to the harmonium, with which we will now deal.

THE HARMONIUM

One of the advantages which the harmonium has over the reed organ is that it is not so easily affected by damp; and it is therefore more suitable for out of the way places than the more modern instrument. The harmonium, too, is better adapted for leading choirs, as its reeds seem to have greater carrying power. The expression stop (which is peculiar to the harmonium) is, in the hands of a skilful performer, an asset of great value in the rendering of solos, &c.; but, alas, it is seldom used, except as a means to burst the bellows!

DISMANTLING FOR REPAIR.

Often when one is summoned to attend to a harmonium breakdown, maybe at the village school, the feeders are found with gaping holes at the corners and it is not much use attempting to make a satisfactory job of the instrument while the school children look on; but if a temporary repair is needed, very little skill is required to glue on some pieces of leather and so patch up the holes. Once have the instrument brought in triumph to the workshop and we can proceed in a workmanlike manner to turn it out equal to new. The sketch (Fig. 9) will show just where the parts to be referred to are placed. Before any work can be done to the bellows, the whole mechanism must be removed from the case. Presuming that the harmonium needs entirely overhauling, we will remove each part of the action separately and do whatever is necessary before replacing it. After removing the lid of the case and the board just beneath, the stop action must be unfastened and the hinge pins withdrawn. Next, two catches under the key-board must be released, which will allow of the key-board being lifted up; and, if the hinge pins are withdrawn, this part may also be removed.

The third portion containing the reeds may now be lifted off after the back catches have been pushed to one side and the two large screws removed from the front. It is now a simple matter to withdraw the screws which secure the bellows and to remove

them bodily from the case after having disconnected the pedals. The rockers may be removed entirely until the bellows are again installed after repairs, when the rockers may be greased on all working parts before being replaced.

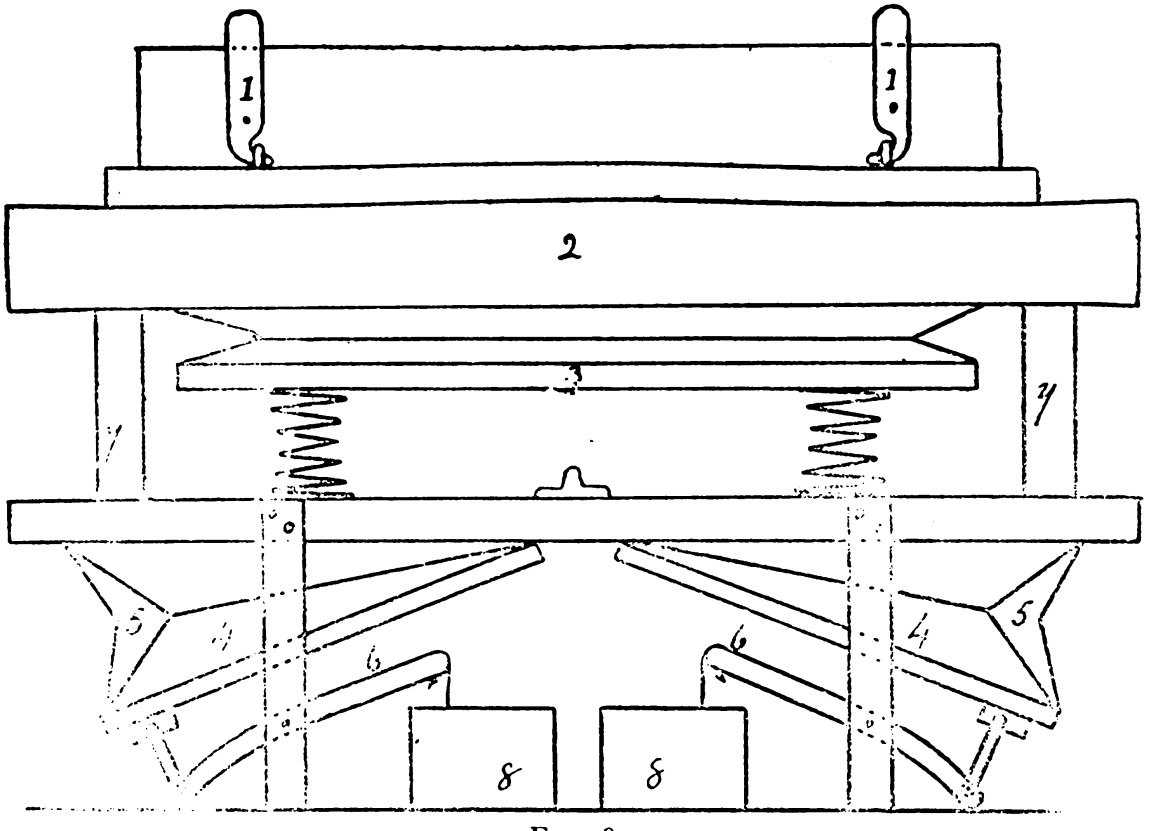


FIG. 9.

(1) Back Catches. (2) Air Chest. (3) Reservoir. (4) Feeders. (5) Corner Pieces or Gussets. (6) Rockers. (7) Chimneys or Wind Trunks. (8) Treadles.

BELLOWS.

The bellows having been removed from the case, turn them upside down on a couple of trestles and the extent of the damage can then be ascertained. In addition to the two gussets being worn out, the hinge connecting the upper and lower portion of the feeder will probably require renewing. Remove the two old gussets and the remnants of the hinge; but, before attempting to glue on a new hinge, make the feeder rigid by fixing a strip of wood across the end with a couple of nails. Cut a piece of

leather (sheepskin) to size — that is, about an inch and a quarter wide — and pare away the edges with a sharp knife, the rough side being uppermost for this operation. Now glue it (also on the rough side) and apply quickly to the work. Dip a piece of rag in the hot water of the glue pot and wipe the leather with it, at the same time pressing it into its place. This first strip of leather (which is placed *inside* the feeder) must be pressed right into the joint, or when the feeder is compressed the leather will burst. An old ivory head does very well for pressing the leather in the joint. Some repairers prefer to put a strip of linen or tape for the inside hinge, while others do not use any linen at all. But if the feeder is repaired as shown in Fig. 10, there will be no cause for

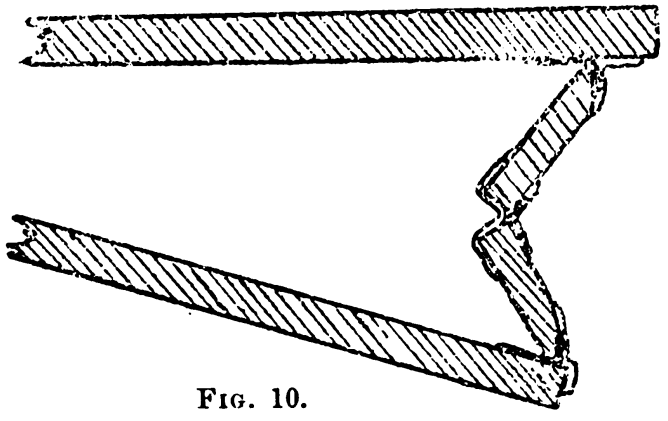


FIG. 10.

dissatisfaction. In our sketch the linen is represented by the thick lines and the leather is indicated by the thin lines. The centre hinge is made first (if the three hinges are to be renewed); and, when this is dry, the two portions can easily be fitted.

After the hinges have been made sound, the gussets (or corner pieces) may be fitted in the following manner. Take a piece of paper and fold it across the middle, placing the fold where the hinges come. Now run your finger (or a piece of heelball) along the edge of the wooden sides and you will have a good pattern of the size and shape of the aperture to be covered. The leather will, of course, have to be cut half an inch larger all round than the pattern, to allow for glueing. In order to make the leather lie flat, it will be necessary to make two cuts in the edges at either end of the centre line. Pare the leather away all round the edges, glue and place in position, using the hot water saturated rag as before described. In glueing on the gusset, we must not forget to allow room for the feeder to close properly without

unduly stretching the leather or we should soon have the corners worn through. Cut two pieces of leather about two inches long by an inch wide; and, after paring the edges and rounding two corners, glue them over the places where the nicks have been made, allowing the rounded end to overlap the gusset slightly. This will complete a good corner; and, after the others have been similarly treated, the whole may be finished off with blue paper, which serves to make the work look neat. Fig. 11 shows the gusset and the strengthening piece glued on. I have shown the gusset rhombus shaped; this is not strictly correct, but it will show better the object of the sketch.

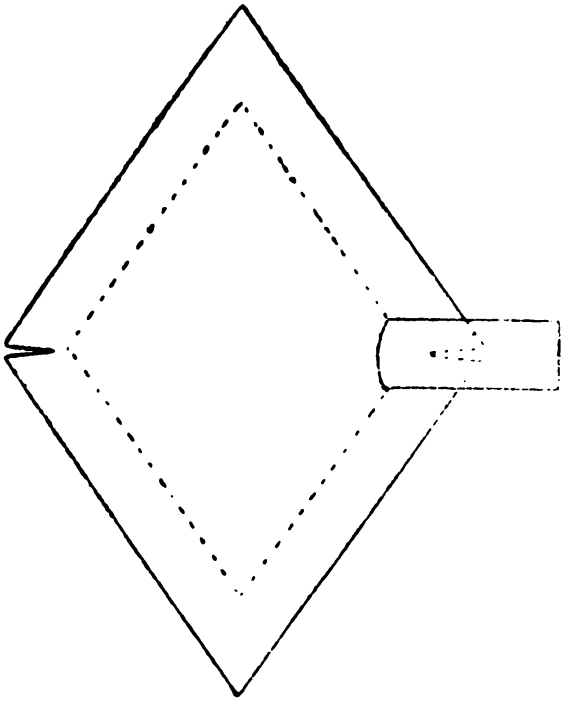


FIG. 11.

NOTES RUNNING.

If a harmonium has been for some time in a very damp place there is likely to be a running of the notes, caused by the board upon which the pallets rest having become partly unglued. This will mean that we shall have to remove all the pallets and the reeds and take off the board with the aid of hot irons. The old glue must all be cleaned off both from the board and from the divisions; and when the fresh glue has been applied to the work —previously warmed—a good pressure must be brought to bear on it. When the instrument has not suffered severely from the

damp and only a few notes run, these can be stopped by filling in with glue. In the harmonium, there are two boards liable to become unglued, the sound-board upon which the reeds are screwed and the upper board whereon the pallets rest.

In a case of running, it must first be ascertained which board has become loose and we may then proceed in the following manner: Remove all the reeds near the portion affected (and also the pallets) and glue a piece of brown paper over the reed holes, supposing that it is the soundboard side which we are repairing; then, when the glue has had time to set, pour in some hot glue, a little in each pallet hole. Afterwards pierce each hole through the brown paper and allow the surplus glue to run out. Should it be the upper board which is at fault, the brown paper would be glued on this and the glue poured in from the reed side. The paper is afterwards cleaned off and the running will in most cases be found to have stopped. This is not quite so scientific a method as removing the board; but it is quite as effective where the case is not serious, while the cost of this repair is slight. Of course, the glue may be run in as described and the board forced down under pressure.

CYPHERING.

Cyphering in a harmonium is often caused by dirt finding its way under the pallets, the spring having become weak or the key or the pallet sticking. These faults and the remedies for them need no describing, as they are at once apparent on an examination; but there is one cause of cyphering which does not show itself so plainly. This is when the pallet has warped slightly or when the board upon which the pallets rest has become uneven. In the first case, remove the leather and make the surface of the pallet true by rubbing it on glasspaper; but, if the board is not quite level, it is better to make the pallet bed on it—say by inserting a piece of paper under the leather at one end—rather than by attempting to level the board.

PERCUSSION ACTION.

The percussion action, the introduction of which formed a marked advance in harmonium construction, is not likely to give much trouble; but dampness may cause some of the centre pins in various parts of the action to become tight. This defect is, however, easily remedied by fitting new pins exactly as in a piano

action. Blackleading and burnishing on the parts where there is friction will tend to smooth working.

REED PAN.

The portion of the harmonium containing the reeds—sometimes called the reed pan—must of course bed down firmly on the wad beneath when the back catches are fastened. There is often an escape of wind at this joint, which is likely to be overlooked. What appears to be a solid wad will, on closer inspection, prove to be little more than a tube of leather, the moths being responsible for having carefully removed the filling of wool or whatever has been used. New wad may be purchased by the yard; and it is much better to glue on a length rather than attempt to pack up with pieces of leather.

STOP VALVES.

Most harmoniums are fitted with small valves (one for each half set of reeds) which are to many tuners something of a mystery; but their function is to allow any air which may escape through the stop valve when this should be shut to pass out, thereby preventing the stop from speaking when it is not required so to do. These small valves should close properly when the stop is drawn or there will be much loss of wind from this cause. Everything which allows air to escape should be attended to; for loss of air means loss of power and moreover the harmonium will play jerkily unless some amount of reserve can be maintained in the reservoir. Badly fitting pallets are a frequent cause of loss of air, each pallet doing its part to drain the resources of the reservoir only just short of cyphering. The best way to discover exactly where the leakage occurs is to bring a lighted taper near the suspected area, when the flame will soon indicate the place from which the air is being emitted.

EXPRESSION STOP.

If after making the harmonium fairly airtight there is still unevenness in the blowing, the cause must be looked for in the expression stop and its connections. When this stop is pushed in it opens the air passage at the top of the reservoir, putting this in communication with the feeders and thus equalising the force of the air current to the reeds. It is quite likely that, owing to some displacement of the parts, the expression valve does not

open wide enough, if it opens at all. While attending to the expression stop valve it will be easy to see that the stop valves all close properly and at the same time to grease the working parts.

GENERAL ITEMS.

The work of repairing the harmonium is now almost finished and there remain only a few minor matters to attend to. The touch pads probably want renewing and these may be punched out of a piece of soft leather; or, if a punch is not available, small square pieces will answer just as well, even if they do not look quite so smart as the punched pads. See that the pads come directly beneath the screws in the keys and apply a little tallow to the screw heads; this will prevent wear and will make the touch easy. The keys will want levelling by turning in the screws in the high keys and *vice versâ* on the low keys. In a large harmonium containing (say) two and a half rows of reeds the keys have a balance rail under the centre; and the keys would, in this case, be levelled by paper punchings. The screws should not rest on the touch pads in an instrument of this size or cyphering will be caused. The last thing to be done excepting the tuning—with which I have previously dealt—is to tighten up the stop levers and connections.

General Hints.

Care of the Reeds

THE stops should be kept close when the organ is not in use, or dust will work into the reeds and prevent them from speaking properly. Sometimes a reed will be silent, or produce an unpleasant jarring sound. If such is the case see which set the affected reed is in. If in diapason or melodia sets they are usually at the back ; if in the principal, vox céleste or flute sets, they are usually in the front. To get at the back sets, take out the top section of the back, draw the stop containing the affected reed, press the right knee lever to open the swell, and with the reed hook, which will be found in the back of the organ, the reed may be drawn out. Be careful in doing so to hook the reed hook into the small notch at the outer end of the reed, or the tongue may be injured. Tap the edge of the reed block lightly and the obstruction will fall out. Do not tamper with or interfere in any way with the tongue, or the reed will be thrown out of tune. When no dust is discovered and the reed is in the bass end, it may be that dampness has caused the cell to swell, pressing in the side of the block. In this case, file the outer edge of the block in the centre only, which will usually remedy it. If you cannot discover the cause of the trouble, replace it by a new one. If the reed is in the front take out the screws from the key blocks and ends of the lockrail, remove the lockrail, raise the swell as before, draw the stop, and the reed can be got at. If the reed breaks or cracks replace as before with a new one.

Tuning the Reeds

ALL the reeds should be dead in tune (theoretically), with the exception of a half-row in the treble, which is usually a shade flat and is labelled "céleste." In some instances, the half-row will be slightly sharp to the diapason stop and labelled "vox jubilante" or some other fancy name. As a matter of fact, it is very difficult to so tune three or four rows of reeds that on depressing a key not a wave shall be heard ; but of course there should be nothing rough about the tuning when done.

When tuning, the only practical manner of proceeding is to continually raise and lower the key-board, reeds, &c.; but much may be done to lighten the labour if a pulley-wheel is screwed into the ceiling and a rope passed over and one end attached to

the harmonium reed pan. An assistant will be necessary to pull on the rope as required. It is quite an easy matter in this way to turn over a large harmonium.

Petrol for Cleaning Reeds

OF the many uses to which petrol has been put since supplies of the spirit have become generally available, one of the greatest utility is that of removing dirt from reeds before commencing to tune. Of course, care should be taken not to use petrol in close proximity to any naked light; it is safe only when used during daylight.

Keys Dropping

CASES will be met in which the keys appear to have dropped so that there is little depth of touch, although so far as can be seen nothing is out of place. This trouble often occurs in organs which have been in use some years, by reason of the plungers having become embedded in the soft leather which covers the valves or in the cloth to be found under the keys.

There are two ways in which the touch may be deepened: by glueing a piece of cloth on each key over the piece already there, or by planing away the supports under the front of the key frame. In many instances this frame is supported on two small blocks of wood, and it is a simple matter to chisel off a portion of the two front key-blocks.

Keys Sticking

IF a key when pressed remains down, it is usually caused by the swelling of the wood on the upper side of the key so that the hole for the guide pin in front becomes tight. Move the key up and down a number of times, pressing firmly to the right and left so that the hole may be enlarged. If this should fail, it may be caused by the lockrail being too close and rubbing against the fronts of the keys In this case remove the key blocks and the lockrail. Below the keys about the centre will be found a projecting screw-nail which holds out the lockrail. Unscrew this sufficiently to press the lockrail out.

Interior Noises

THESE may sometimes be due to the mute covering the reeds not shutting down close. A chip or a shaving may be drawn in and this will not allow it to close; or the wood may have warped, or brass wire spring corroded or broken. If the latter is the case, it will need to be renewed, or if too weak replace with a gauge thicker wire. A careful examination will

reveal any such trouble, which may easily be got at by removing the back and disconnecting the vox humana.

Noise in a harmonium under the keys is frequently caused by rust on the heads of the screws that raise the pallets. A little soap on the heads will cure the trouble. If the leather washers are worn, renew them. Pallet springs may be strengthened by turning in the screws that hold them. If much corroded, a new set may be obtained to pattern from any supply house.

Several Notes Sounding

WHEN several notes sound together, it is evidently a case of "running,"—i.e., the organ having become damp, the cavity-board containing the reeds has become unglued from the valve-board, with the result that when one valve is opened the air is drawn from the reeds on either side of it, in addition to the proper note.

The only remedy in a case of this description is to remove everything from the cavity-board, reeds, pallets, stop mutes, and to run in glue, afterwards placing the work under pressure. This requires great care, or pieces will be broken out of the cavity-board.

Placing the Instrument

THE organ should be placed, when possible, against an inside wall, in a room of dry, even and moderate temperature, not close to a fire or register, or a window. An organ being made principally of wood, is susceptible to heat, cold, and especially dampness. Extreme heat will cause the parts to contract, and dampness will cause them to swell, in which latter case the action is liable to stick or move with difficulty. Instruments that have been considered out of order have been made right by keeping them in a warm room for a few days.

Advantages of the Pedal Reed Organ

PEDALS render the reed organ an instrument which cannot fail to satisfy the most exacting musician, whose range of composition becomes unlimited and who recognises the fact that one of the chief objections to the pedalless organ is the small amount of music which has been written for it. The whole scope of organ music, classical and modern, can be played upon a two-manual reed instrument, almost exactly as written.

Squeaking Noises.

SQUEAKING noises under the keys of a harmonium are probably caused by the screws in the underside of the keys being rusty and grating on the pallets when they press down. A little tallow on the leather washer where the screw head touches will

remedy this disagreeable noise. Also put a little tallow under the ends of the touch springs. The straps on the feeders and the valves on the wind trunks ought to be renewed with new leather. If they are curled with damp, they allow the wind to escape. See to the pedal hinges: these stand near the floor and are often allowed to rust away for need of oiling.

Actions and Stops

MAKERS produce actions with one, two, three or four rows of reeds upon their cavity boards, and build them into the different cases. Few produce more than eight or nine such actions, although selling perhaps thirty models. Thus the same two-row action may appear in many forms at varying prices; with four sounding stops (which are all that are absolutely necessary to control its four two-and-a-half octave sets of reeds), or with ten, twelve or fifteen (of which it follows that six, eight, or eleven must be more or less unnecessary dummies).

Cavity Board Unglued

WHERE there has been only a slight running of, say, a few notes, a little soap has been known to have the desired effect. If the board has separated very much, it will have to be reglued This is a job that requires great skill and care. All reeds will have to be drawn and pallets removed, and a thin knife with hot glue run between, with a pressure of handscrews to draw the parts together. Care must be taken that the grooves where the reeds fit are kept free from glue: a piece of wire bent in the form of a hook being drawn along each groove. Allow to dry a couple of days before replacing reeds.

While the reeds are out, it is always well to dust them and wash in methylated spirits. Rub a piece of dry soap on the edges of the reeds, which will make them slip into the grooves more readily.

Tremulant Slow in Starting

WHEN a tremulant is slow in starting, and if the hinged portion is quite free, the fault will most probably be found in the wire supporting the leaden weight. This wire must be springy and the weight not too heavy. The correct weight must be found by experiment.

Difference between American Organ and Harmonium

IN the harmonium, air is compressed (by the bellows) past reeds whose beats produce notes, varying with the rapidity of the vibration. In the American organ, the exact opposite takes

place: air is sucked into a vacuum created in the bellows, and in passing the tongues of reeds causes them to produce notes whose musical pitch varies with their length and whose quality and character varies with curvature and breadth.

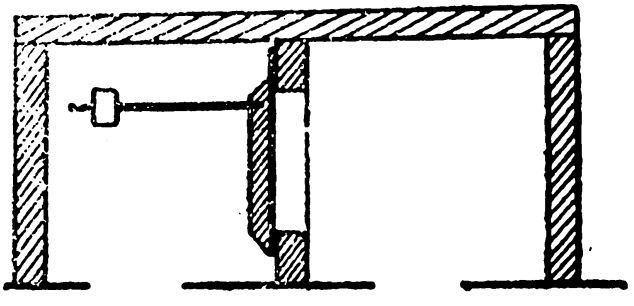
Herein lies the essential difference between the harmonium and the American organ: the former is an instrument of expiration whose reeds are exposed to compressed air in percussion bellows, but are cut off from the atmosphere until stop and key are open; while the reed organ relies upon inspiration, using exhaust bellows, separated by valves from the reeds, which lie open to atmosphere at normal pressure.

The Tremolo Stop

THIS contrivance may be fitted easily to an existing organ, and will be found far more effective than the vox humana fan.

The first thing to be done is to make a small box containing a division piece having a hole in it about two inches in diameter.

Fig. 1



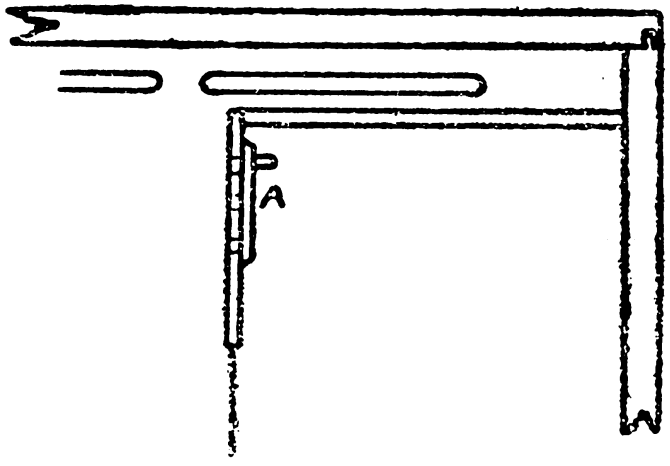


Fig. 2

The style of the box will be seen from Fig. 1, and the size is 5in. long by 2½in. deep by 2½in. wide. It does not matter whether the

measurements are followed closely; the main thing is to have the box fairly air-tight. Now, over the hole in the division is placed a hinged valve, from which projects a piece of wire (size about No. 13) weighted with lead.

The next operation is to remove the top of the air chest of the organ and to fit a compartment similar to that shown in Fig. 2, containing several holes in a convenient place which are normally open but which are closed when the tremolo stop is drawn. A valve similar to those used in the stop action may be fitted with a spring to close it when the stop is drawn out. Where the reed valves occur, the division piece may be a piece of zinc, which will be found thin enough to fit between two valves, as the tremolo arrangement does not usually extend beyond the middle.

The division having been fitted, and a strip of leather fitted upon it to ensure the valve-board bedding well, two holes must be bored in the upper part of the air-chest at the place where the tremulant is to be fixed, one on each side of the partition.

The organ may now be reassembled and the box fitted on, preferably with two catches so that it may easily be removed. The edges should of course be covered with leather, so that the joint may be as air-tight as possible. The tremolo will now be in operation, and it only remains to fit a plunger which will press open the valve A (Fig. 2). When the tremolo stop is drawn, this valve is closed by a spring and the air from the reeds passes through the tremolo box. Should the pulsations be too slow, move the weight nearer to the valve.

Wind Valve Not Closing

WHEN such is the case, the probability is that the spring needs strengthening. The T square may require turning down a trifle, or the brass stop lever may be bent, which results in the valve remaining open a little. The small valves are escape valves, to prevent cypherings. Turn down the screw-eyes, and examine carefully for escaping wind. Most probably the straps across the feeders may need renewing, as they curl up with damp. At the end of the stop is a crank or knee, the bottom of which presses on a brass plate, which in turn presses down a peg of wood. If the brass plate is stiff by corrosion, oil the centres and reduce the peg so that it moves freely. There may also be some grit on the valve. The sides of the valves may have swollen and be grating on the guide pins. It may be possible to open the valve and push aside the guide pins and thus relieve the valve; if not, the valve-board must be unscrewed and the valves eased from the under-side.

Percussion Action

THE hammers of the percussion action are easy of access if the key-board of the harmonium is turned over.

Slowness of Speech

THE slowness of speech of large reeds points to faulty voicing, or probably the voicing has been overdone. Large reeds, particularly those used in the pedal portion of the instrument, are always inclined to be slow in speech.

Rattles, Squeaks, &c.

NEARLY all difficulties of this kind can be obviated without taking the action out of the case. There is hardly anything connected with the working parts that cannot be reached either with the back or the front lockrail out; or, if in the bellows, by removing the centre front above the pedals. Anything that is not at all times firmly held, or like the swell and stop springs only held at the ends, leaving the pedal free, may possibly become disarranged so as to rattle and vibrate. Should such be the case, hold the note or chord that produces the noise, and with the organ sufficiently apart to admit of it, touch with the finger or a thin stick the various springs or other loose parts until something is touched that will stop the rattle. The fault being found, it is easy to apply the remedy, either by inserting cloth between the points of contact or tightening the bearing.

Squeaks are found in the same general way. Make the motion that produces the squeak, and it will always be found at some point where there is friction. Lubricate with tallow where the contact is between wood and metal. If the friction is caused by derangement of the parts, adjust them so as to obviate the difficulty. Sometimes when pumping, an unpleasant noise will be heard, caused by the pedals. With a feather, rub a little oil on the hinges underneath.

Should a pedal spring break, a new one must be procured. When replacing, see that it hangs down perpendicularly when the pedal is pressed full down. If it gives a slight jerk, move one of the ends a little up or down, to make it hang true.

The Expression Stop

IF the reservoir board is examined, a hole in the centre will be seen, with a valve opening into the reservoir. When the expression stop is drawn, the valve is closed and prevents the wind entering the reservoir, enabling the player to control the expression with his feet, as the wind is direct from the feeders. There is a constant pressure on the reservoir from the spiral springs under it, forcing the wind to the reeds.

Faulty Pallets

TROUBLE in a harmonium is often caused by the leather pallets which cover the wind trunks. These may be crumpled and not lie flat, thus allowing the wind to run back instead of filling the reservoir. The remedy is obvious.

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