Repairing and Rewinding Wurlitzer Magnets

by Ben Levy

Part 1. Preparatory Steps

Dead action magnets are a common occurrence in elderly theatre organs. Usually they are tossed into a cigar box and replaced by spares. When the supply of spares runs out, one is faced with the problem of finding replacements, adapting some other kind of magnet to do the job, or else repairing the dead ones.

Repairing magnets is a practical and relatively painless procedure. This article applies to Wurlitzer magnets, and especially to the variety known as "black cap." However, the process should be adaptable to other types as well. It seems that the "black cap" is a common offender and thus is an appropriate subject for a discussion of repair techniques.

The techniques to be described are those the author developed by trial and error and have been applied successfully in the repair of a sizeable number of magnets over a period of approximately six years. They are offered as suggestions, not dicta; it is hoped the ingenious reader will regard them as such and modify or improve them as suits his inclination, skill and facilities. Suggestions by readers on improvements are welcome!

First of all, remove the magnets from the chest carefully to avoid damaging them further. If you grip the magnet with a pair of pliers and yank it out of the chest, you stand an excellent chance of scraping the coils on the sharp edge of the hole in the chest and abrading the windings. Such damage will almost always be difficult to repair, and may necessitate a rewinding job. While this isn't hard to do, it is to be avoided if possible. Dave Brewer of the Detroit Theater Organ Club uses the head of a common nail as a lever to pry the magnet gently loose from the chest, then uses long-nose pliers to remove the two brads which hold it in, finally using his fingers to remove the magnet from the chest. It pays to be careful in this process! After the magnet is out of the chest clip off the wires close to the magnet. File or grind the head of the nail to make it easier to get it under the magnet base.

It isn't any use to try to repair magnets if you can't see what you're doing. Magnifying spectacles (binocular magnifiers with a headband or spectacle bows), or a magnifier lamp consisting of a circular fluorescent lamp surrounding a magnifying lens and mounted on a flexible stand, are essential. I prefer the magnifying spectacles to a separately mounted magnifying glass because they are always in front of your eyes when you want them, do not distort the image or get in the way, and provide stereoscopic vision. Watchmaking, medical, and electronics supply houses list them at about $5 and up. The more expensive varieties will permit you to have your own eyeglass prescription installed in addition to the magnifying lenses if you wish, and are adjustable in various ways that the cheaper ones are not. Since you're on your last pair of eyes, you should treat them to the best. The added comfort and lack of eyestrain will pay off. Install a good light too.

Wurlitzer magnets were made by casting two iron pole pieces into a base of Bakelite (zinc in earlier models); then the coils were slipped over the pole pieces, the coils connected together and the feed wires attached; after which an iron bridge was crimped over the ends of the poles. The completed magnet was then dipped in varnish or shellac. The two coils are connected in series so that when current flows in them one of the two pole ends at the Bakelite base becomes a north magnetic pole and the other a south pole; in other words, they are "horseshoe" magnets. This means that the current must flow in opposite directions in the two coils. The two coils are wound identically, and are connected as shown in the sketch (Fig. 1) in order to achieve this.

The coils are wound on paper tubes which have paper collars slipped over their ends. The winding begins and ends at the top. The beginning of each coil (the bottom layer) extends underneath the paper collar and is soldered

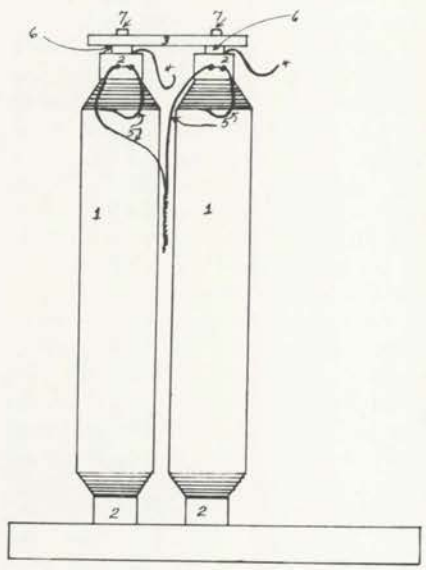

Fig. 1. Schematic of Wurlitzer Magnet (Lead-in wires removed for clarity).

LEGEND

1. *Coils*
2. *Paper collars*
3. *Iron magnetic bridge*
4. *Leads from inner layers of coils (normally attached to heavy lead-in wires)*
5. *Leads from outer layers of coils*
6. *Ends of paper coil forms*
7. *Iron pole pieces*

to the heavier feed wire. The other end of the winding (the top layer) is threaded *through* the paper collar – in and out, as your wife would insert a pin in a hem. This end of the coil is soldered to the similar end of the other coil, the soldered joint being tucked between the two coils for protection.

Lean your defunct magnet (and by the way, make sure it *is* defunct before you fix it: do your own testing) upside down against the side of a tray containing about ¼" or less of denatured alcohol (shellac thinner) for several hours or overnight. This will soften the varnish but will not affect the insulation on the coil wire, which is enamel. The alcohol should cover only the very tip of the magnet, not touching the coils or they will tend to unravel into a gooey mess. After this treatment it will be easy to work the iron bridge up and off, as well as to perform the other operations.

To get the bridge off, hold the magnet near the base, use diagonal cutters or long nose pliers to work the bridge around until it loosens, then pull it off. Use persuasion rather than violence, and don't cut it in two.

Underneath the bridge are several turns of relatively heavy cotton-covered feed wires. These are soldered to the No. 37 wire of the bottom layer of the coil. Carefully unwind these lead-in wires (they are interlaced in such a way that they don't always go where you think they do). If you find out after this that they are still attached to the coil windings, cut the fine wires so as to leave their ends sticking out from under the paper collar. If the fine wire breaks or has corroded in two, don't fret; you'll probably be able to find the beginning of the coil later.

With a needle or toothpick carefully pry the ends of the outside (top layer) of the coils up from the their position between the coils. These are (or should be) soldered together. Cut the wire so as to separate the two coil windings. Never mind if they break off at the paper collars. The object is just to find out where the ends of the coil enter the paper collars. Take the needle and pry one of the coil ends where it enters the hole in the collar (see Fig. 1). If it comes out of the collar easily grasp the end and carefully unwind a turn or two from the coil itself so that you won't lose it. Do this with both coils. If it doesn't come out easily, it isn't broken in the collar, and you should go on to the next step, which is to remove the collars. Do this in any case.

Carefully insert the needle under the collar and pry upward until you break the collar (see Fig. 2). Do this in several places around the circumference until you loosen and can remove the collar, usually in several pieces. Caution! Do not insert the needle too far under the collar or you'll get into the windings and break wires! One of the pieces of collar you'll remove will have the coil end threaded through it if you couldn't pull it out before. Use this as a handle to unwind a turn or two of the fine wire from the coil and cut it off.

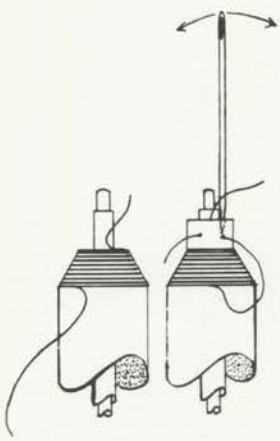

Fig. 2. Using a Needle to remove paper collars.

Underneath the collar and pointing straight toward the top of the magnet pole will be the inner coil end. Pry this up and pull it out carefully, unwinding perhaps half a turn from the inner layer, until you have enough wire to work with—say half an inch. Use your fingers. If it won't unwind with a gentle pull, leave it alone; you can solder to it as it is. If it breaks off underneath the coil, you will have to rewind the entire coil. Do the same with the other coil and you'll end up with the four ends of the two coils out in the open.

Somewhere in the above process you will probably have found the reason for the magnet's being dead, if it is of the black-cap variety. In this particular variety the problem almost invariably is that the fine wire has corroded in two in one or more places where it has been in contact with the paper collar. You will note a small green spot where this has happened. Generally you can locate the trouble by looking for these green spots after the alcohol dip, which tends to make them prominent. It's probably caused by sulfur content in the paper.

In the next installment, Mr. Levy explains how to test the existing coil windings, how to repair open circuits and "shorts," how to remove a badly damaged coil and save the magnet frame which can be rewound, how to connect the repaired coils for the correct polarity. A later installment will explain the actual rewinding of coils on existing frames.

A BOMBARDE Sequel

In the October 1966 issue of this magazine we featured a technical report on the restructuring of a Wurlitzer 3-11 console to accommodate 26 ranks of pipes. The project was undertaken by John Ledwon when he and his father, Ray, made a master plan for the construction of a reasonably large instrument, properly installed in the best possible acoustical setup. John already had a 3-11 Wurlitzer in his Canoga Park, Calif. home but he was unhappy with the limitations of the single stoprail console and the cramped acoustics of his inadequate music room. With the new 3-11 console, which he had shipped across the country from Plattsburgh, New York, John envisioned an ideal setup – a secluded "aerie" where he could play anytime of day or night, without neighbors close by to complain if he played after 10 P.M.

Gradually the plan took shape and one day John saw a hilltop while driving through Agoura (near Los Angeles), and it seemed to beckon to him. He went home and told his parents that he had found his "eagle's nest." They accompanied John to the solitary, deserted hilltop – and agreed. If the site was available, this would be the place.

Three years have passed since we ran the console rebuild article. In the meantime, the building has been erected on the hilltop and the rooms furnished tastefully. The Ledwons have moved in and John has become a schoolteacher for gifted children. The floor plan is almost exactly as it appeared on page 20 of the October 1966 TOB, with one exception. We showed the console facing the chambers. It has now been placed with its back to the corner.

To refresh the memories of those who don't keep their old TOB's on file, the addition of 8 ranks was accomplished by the "ancillary" method. Stopkeys for the original 11 ranks remain very much as they were, and seven ranks were added in the usual "unit" manner, available on more than one manual and at more than one pitch. However, eight ranks were added in one group which is switchable to any manual from one stopkey. This system avoids multiple additions to a stoprail because the "ancillary" ranks are controlled by one set of stopkeys for all manuals rather than separate stopkeys for each manual. This space-saving device appears especially on larger Robert Morton models. For example the Morton in the San Diego Fox has an independent string chamber controlled by the ancillary system. These may be switched to the desired manual by the flip of one stopkey.

The installation is only partly complete. John and Ray are doing it slowly but carefully. When completed, it will be a showpiece which will equal many of the finest in southern California and surpass many. Its large listening area, non-parallel walls, silenced wind conditioners and carefully selected and installed pipework – these alone make it a formidable contender in the "excellence" department. But there is still much to do before it sounds out in the full glory of 26 unified ranks. Meanwhile, John says that it's thrilling just to anticipate that great day when it will finally be ready to play.

– Carole Angle