

Alarms of American Mantel Clocks

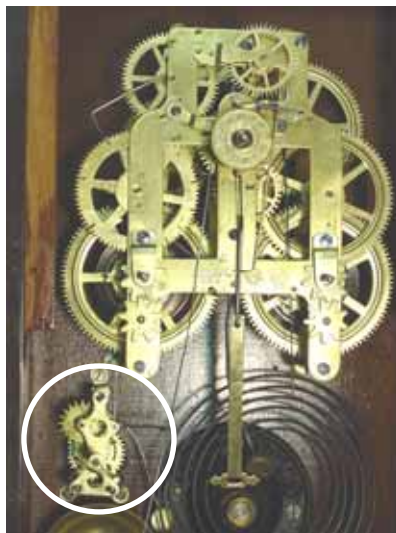
By David J. LaBounty, CMC FBHI

Introduction

I can remember one of my greatest fears as an apprentice clockmaker. It would happen while I was working the front counter, handing back clocks I hadn't seen before to customers who expected me to be the expert on every minor detail of their timepiece. I was sure they would ask me an in-depth question I didn't know the answer to and I would then show my ignorance by calling for help from the Master. This overwhelming feeling of stupidity was particularly evident when I was handing back American mantel clocks with alarm mechanisms. "How does the alarm work?" they would invariably ask. My pat reply for many years was "Let me get someone to help answer that question!" Now, I think I've overcome my hang-ups of not knowing it all and don't have any problem telling a customer "I don't know, but I'll find out!" Clockmaking is a lifelong learning process and there is no way anyone can know it all. But we can pass along what we *do* know to others in the hopes they will benefit. So, to finally get over my fear of alarms, I'll pass on what I've learned and hopefully prevent other apprentices from having the same fear.

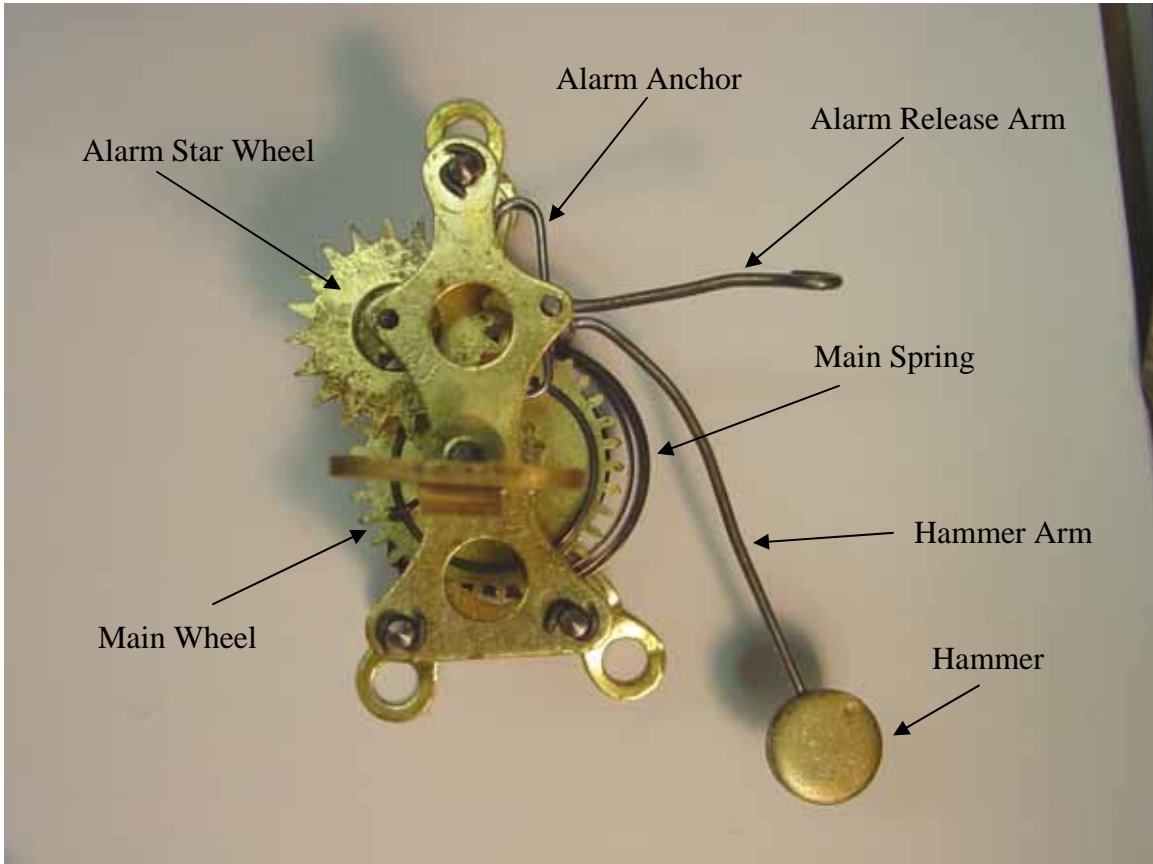
The Alarm

Clocks with alarms are easy to spot. They have a set disk in the center of the dial, under the hour hand with either Roman or Arabic numerals. (Of course, there are exceptions but I'd like to stick to the most common.) Once you spot the disk, look for the alarm mechanism itself. It is usually in the lower half of the case looking something like this...



Typical American mantel clock alarm mechanism.

How It Works



Detail of the “rattling” alarm mechanism.

The alarm mechanism itself is a relatively simple affair consisting of a two-gear train that runs what is essentially a miniature pendulum (the hammer). Close examination will show how similar the alarm is to the time train. There is a main wheel consisting of an arbor with a spring hook, a ratchet wheel, click, click rivet, click spring, and a mainspring. There is an escape wheel (alarm star wheel) with non-cycloidal, evenly spaced, radial teeth on an arbor with a pinion. There is an anchor, with entrance and exit pallets, attached to an arbor, that functions to regulate the release of the mainspring. In this instance it is recoil and acts exactly the same as in the main clock mechanism with entrance and exit drop as well as lock. And finally there is a pendulum (hammer) that gives momentum to the anchor and keeps it in motion. The purpose of the alarm mechanism is quite different than that of the time train, however since time-keeping accuracy isn't important. All it has to do is move the pendulum at a high rate of speed.

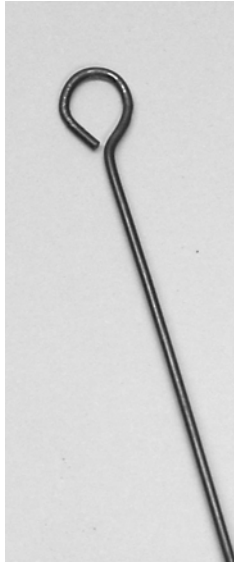
Once the mainspring has been wound and is putting pressure on the train, the alarm will vibrate or rattle unless something is done to keep it from doing so. That is why there is an alarm release arm attached to the arbor of the alarm anchor. A slight pressure against the release arm will lock the anchor in place arresting the motion of the star wheel. This pressure is usually upward causing a tooth of the star wheel to lock on the entrance pallet of the alarm anchor. Once the pressure on the release arm has been removed, the alarm anchor will rotate, releasing the tooth of the star wheel, starting the rattling process. The rattling will proceed until the mainspring is completely unwound or until the pressure is restored to the release arm.

The release of the pressure on the alarm anchor must be done at a specific time. This is accomplished by the use of a cam and lever attached to the main clock mechanism and a wire connecting the release lever to the alarm release arm. The release cam, mounted on a set disk, is friction fit to the hour pipe and rotates with the hour hand as the movement runs. There is a notch cut in the cam to allow the alarm release lever to fall and remove the pressure on the alarm release arm once in a twelve hour period. The release lever keeps tension on the alarm release wire (and thus the alarm release arm), arresting the rattling process, until the notch in the release cam is reached. The set disk may be rotated on the hour pipe to a specific position so at a pre-determined time the alarm will be released to rattle.

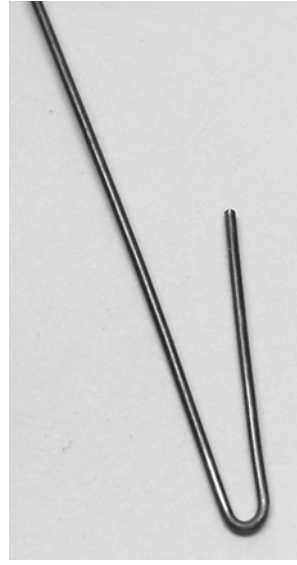
Servicing

Now that I've identified my fear, let's talk about how to deal with it. Servicing the alarm mechanism should be part of servicing the main works. It may not be necessary to even take the alarm mechanism apart but special attention should be paid to undue wear especially in the area of the click and click spring. Any looseness in the rivet, burrs on the click, or miss-shaped click spring should certainly be addressed. If you've ever had your fingers smacked by a run-away mainspring you know why this area takes priority! Don't be fooled by the size of the alarm mainspring. It will still hurt if it gets away. Oiling should be done as in the main movement; pivot holes, click, pallet faces, hammer pivot points, and light weight grease on the mainspring.

Another part of servicing the alarm is the condition of the release wire. This is the thin, relatively soft, steel wire connecting the release arm to the release lever on the movement. It should be 20 gauge (0.032") steel, be fairly straight and attractive, and have proper looking ends.



Nice looking loop end at the top of the wire.



Properly proportioned hook end at the bottom of the wire.

If the wire needs to be replaced because it is missing, the wrong material, too short, mangled beyond recognition, etc...hobby shops carry a very nice soft steel wire that can be used provided it is slightly hardened by stretching. Clamp one end of the soft wire in the vice, unwind about two feet off of the spool, and pull...hard. You will be able to feel the wire stretch (just before it breaks off at the vice) and you will have a very nice looking straight piece of wire.



Stretching soft wire to make a new alarm release wire.

Now that you have a nice straight, shiny, new piece of wire you will have to put a proper looking loop at the top. Use a pair of round-nose pliers and make the loop (see picture) about a quarter of an inch in diameter. Hook your new wire onto the alarm release lever on the main movement (installed in case) and cut the wire so it clears the bottom of the case.



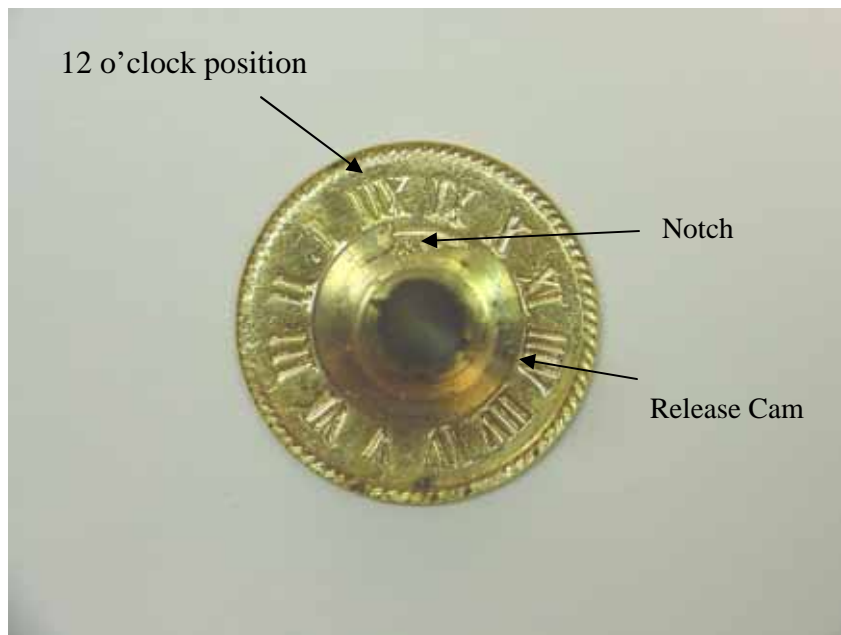
New wire, looped and attached to the alarm release lever.

Install the alarm mechanism by slipping the release wire through the loop in the release arm before you screw the alarm movement to the case. Don't bend the wire just yet. Now that the alarm has been serviced and a new wire *partially* installed, it is time to make a few adjustments and bring this to proper working order.

Adjustments

Look closely at the alarm release lever and make sure it is free to travel. It should clear any protruding pivots or bushings and not be bent hard against the front plate. It should move freely on the shoulder screw without any stickiness. Remember, don't oil levers!

Mount the alarm set disk on the hour pipe by gently pushing and twisting until it is properly seated. Don't forget to lift the alarm release lever so it clears the cam on the back of the set disk! If the disk goes on too easily it may need to be tightened by gently pinching the slotted pipe with a pair of *non-serrated* pliers. If it goes on too hard and is very difficult to turn, it may need to be loosened by opening up the slotted pipe. A tapered punch the proper size works well. Check the alarm release point by rotating the set disk *clockwise* and stop at the point of release (when the alarm release lever falls into the notch in the alarm disk release cam). Look closely at the numerals on the disk. The 12 should be straight up, not even slightly off center. If it appears to be off, see if the disk is loose on its collar. A slight twist of the disk, without moving the cam, may bring it back to where it needs to be. But be sure and tighten the disk once you get it there by peening the rivet on the front. If it is tight on the collar but is extremely far off you may need to loosen it, adjust it, then re-tighten.



Back side of the set disk showing the release cam and the notch almost lining up with the 12. This will have to be adjusted slightly.



Proper position of the alarm set disk at the point of release.

If the disk is firmly affixed to the collar and yet is releasing *slightly* early or late, then adjustments will need to be made on the alarm release lever. Bend the tip of the lever slightly one way or the other until the alarm releases at the proper time.



Adjusting the alarm release lever to obtain the correct release point.

Finally, we move to the alarm mechanism itself and the adjustments there. Start with adjusting the hammer arm so the hammer will hit the bell squarely and not bind the alarm anchor if too close to the bell. It is better to make adjustments at previous bends so you

don't end up with an arm that meanders. Yes, you will have to give the alarm a couple winds, so be prepared to make some noise from here on out! It is a simple matter to catch the release arm and stop the alarm to make adjustments.



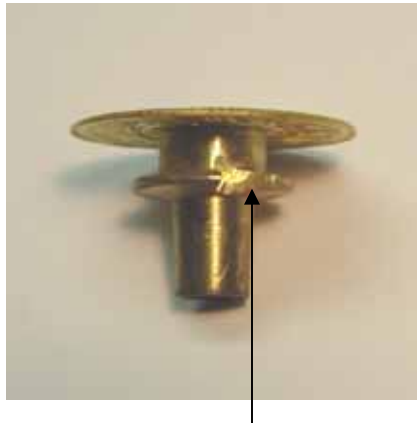
Adjusting the hammer arm to properly strike the bell without binding the alarm anchor.

Now we are ready to bend that new wire or see if the old one is the proper length. Turn the set disk so the 12 position is at the top and the alarm release lever has fallen into the notch. With the wire through the loop in the alarm release arm, bend it into a hook shape and cut to length. Make some noise again by giving the alarm a couple of winds. To see if the wire is the proper length, rotate the set disk *clockwise* until the release lever starts up the slope of the notch in the cam. The alarm should stop (before it becomes unwound) due to the little bit of pressure against the alarm anchor. If the alarm fails to stop after the release lever reaches the top of the cam, you will need to bend the release arm down slightly. Conversely, if the alarm doesn't go off at all when the release lever drops into the notch, the release arm will need to be bent up slightly.



Adjusting the release arm for the proper start and stop of the alarm.

Ideally, the alarm should be stopped when the release lever reaches the half-way point on the incline in the cam.



Alarm should stop when the release lever reaches this point as the set disk is rotated.

How To Use The Alarm

So now I've come full circle and find myself explaining to you what I was so fearful of explaining as an apprentice. The alarm has been serviced and adjusted and all that's left is to know how to set it.

To set the alarm, rotate the set disk *clockwise* only please. The disk will turn counter clockwise but the release lever will get bent and be out of adjustment if it is forced past the notch in the cam. Rotate the disk until the time you want the alarm to go off is directly under the hour hand. For example, if you want the alarm to sound at 5:30, rotate the set disk until the hour hand is over the space between the V and VI. With a little practice you can achieve an alarm release to within a couple of minutes of the exact time. They weren't designed to be accurate to the minute but plus or minus ten minutes is achievable without too much trouble.



Setting the alarm to go off at 5:30. Note the position of the set disk under the hour hand.

Don't forget to wind it, just a little, or it won't do anything at the proper time. If you wind it up all the way, it won't stop until it has run completely down forcing you to run screaming out of the building to get away. The alarm is very noisy and will certainly get your attention when it goes off.

One last detail to mention is that the clock can't tell the difference between a.m. and p.m. so the alarm will go off the next time the release point is reached. If you want to get up at 5:30 a.m. then wind the alarm, just a little, before you go to bed at night. If you want to scare your co-workers at the clock shop at 5:30 p.m. (just to let them know it's time to quit) then wind it, all the way, just before you leave at 5:00 p.m.

Acknowledgements

Special thanks to Jerry Faier, CMC and his wife Sue for their training and expertise. I swear it wasn't me who wound all of the alarms!