RESTORATION PROJECT

FIX YOUR OWN CAR CLOCK

by M. H. FOX

Some time ago I put in my two cents worth and said that you shouldn't attempt to get your old car clock running again by shooting it full of WD-40. Having dropped this shoe I was challenged to drop the other shoe and tell you the right way. Well, this is the other shoe!

First, and most important, you must realize that *you* can do it. People who restore and maintain old cars have more than enough talent to clean and oil a clock. If, on the other hand, you are a "Gentleman Restorer" (one who farms all the work out), here is one more thing for you to farm out. Like so many other things, successfully restoring an old car clock is a matter of a few tricks and a little faith. I'll try to teach you the tricks. You'll have to get the faith that the tricks will work. Foremost, remember that a clock is just another machine. It's not that delicate. It's not that rugged either (no place here for the fine art of Sledgehammer Maintenance). Take your time, work carefully, and everything will turn out just fine.

Before you get started, there are some tools and supplies that you will need. They are listed below:

Some small screwdrivers (not magnetized).
A pair of slip-joint (gas) pliers.
An old nylon paint brush.
An old toothbrush.
A gallon jug.
A plastic container (the bottom half of a milk container will do).
A small plastic container to hold small parts (an old margarine tub and lid will do).
A small file or burnishing tool.
A blower type hand-held hair dryer.
A magnifier which leaves your hands free (unless your eyes are real good).
A clock oiler.
Clock cleaning solvent.
Clock oil.
An ohmmeter or continuity tester.
A clean, well lighted place to work near a sink.

Most of these things should be available around your shop or home. The three that probably aren't available are the clock cleaning solvent, clock oil, and oiler. Later I'll show you how to make a clock oiler, and following is a list of places to get the clock cleaning solvent and clock oil.

S. La Rose, Inc.
P.O. Box 31208
Greensboro, NC 27420
(919) 275-0462

Swest, Inc.
1725 Victory Blvd.
Glendale, CA 91201
(818) 246-8385

Norkro Clock Co.
P.O. Box 787
Fillmore, CA 93015
(805) 524-4140

R.V. Tapp Imports
13525 Alondra Blvd.
Santa Fe Springs, CA 90670
(213) 921-5611

Tell them what you are up to and they will be as helpful as they can. Get the smallest sizes that you can. At that, it will probably last you a lifetime. Get the water-based solvent (L&R). It is far safer than the cyanide-based cleaner.

There are many more places than these to get your supplies. These happen to be places that either my students or I deal with. If you can get your supplies locally, so much the better.

Make sure that you buy *Clock Oil*. It is different than other oils. You can also use it on other small instruments; but for your clock, like the Valley Girls say, "Use it, for sure, for sure."

Some people have a fear that if they open a clock, ten thousand springs, gears, and other terrible things will jump out and be lost forever. So that you don't feel that way, let's talk a bit about what you can expect to find in there.

Types of Car Clocks

Depending on the age of your car, you can expect to find one of three kinds of clocks. These are as follows:

1) Hand wound 8 day clock
2) Electric rewind clock
3) Electronic (including quartz) clock

Before about the mid-thirties, hand wound clocks were the thing. If you have one of these, take it to a competent repairman. I can't teach you how to fix these here. It is easy to tell if you have a wind-up clock, because somewhere on the clock is a way to wind it (this may sound ridiculous, but you would be amazed). It is also easy to tell if you have an electronic clock because these usually say so right on the clock face. These, for our purposes, can be considered non-repairable. Actually they can be fixed, but it takes an awful lot of test equipment. That leaves then the electric rewind type.

Electric rewinders fall into two categories: rotary and linear. These are just what you would think they are. The rotary type, which looks like a simple motor, winds the clock by rotating about 45 degrees. The linear type, which looks like a relay or voltage regulator, winds by snapping its armature and batting the contact arm around. In any event, there are two contact arms. One is connected to the rewinder and the other to the clock mechanism. The one connected to the movement slowly moves toward the other as the clock runs down. When they touch, the solenoid is energized and its snap action winds the clock. As the clock is wound, the contacts are separated and the solenoid is de-energized. This action is the ZZZZT sound that you hear about every five minutes when the clock is running.

As you get into your clock, you will discover that, like people, no two seem to be alike. The principles will be as I describe; the details will probably be different. There is a message here: at each step of the way, *study your clock to see how it goes together before you take it apart*. Draw diagrams or take notes. If worse comes to worse, you can always contact me through *Skinned Knuckles*.

Typical Clock Problems

Well over 90 percent of the time, your clock suffers from one of only three problems. These are as follows:

1) Dirty
2) Pitted contacts
3) Poor electrical connection

Clocks don't really get dirty (unless you shoot them full of WD-40). Instead the lubricant gets stiff with age (don't we all?) and acts more like glue than oil. High under-dash temperatures help to accelerate this process. Each time the clock winds, the contacts snap open and the current flowing through the coil is interrupted. This interruption process causes a spark to jump across the contact points. To prevent this phenomenon, auto manufacturers put a condenser across the ignition breaker points. Car clock manufacturers aren't so kind. After several years of sparking, the contacts become so pitted and corroded that they will no longer pass enough current to allow the clock to rewind; it simply runs down. Also electrical connections may loosen, and then current will no longer flow.

It is the purpose of this article to show you how to cure these miseries. Unfortunately, the thing that scares people the most about fixing a clock is the cleaning and oiling process. Also, unfortunately, *this is the one step that you must do, no matter what's wrong with your clock*. Don't worry; we'll take you through it step by step. It's really quite easy.

By now, one of three things has happened: you are anxious to get started; you have decided that you really didn't want the clock to run; or you have decided to move to Tibet, drive a yak-drawn cart, and forget the whole thing.

In case you have decided to go through with it, let's get started.

Some time ago *Skinned Knuckles*' Bill Cannon visited my Auto Restoration Class to take some photos while I disassembled, cleaned, and oiled a car clock. These are the photos that will be used to illustrate the following procedures.

Usually you will find that the hardest part is getting the clock out of your car. Auto makers seem to delight in making this part difficult. However, if you persevere, it will come out.

At this point, we can assume one of two things: you are either an avid reader, or you have your clock out of your car and are ready to go. Assuming it's the latter, let's go.

The disassembly process will involve removing a fair number of nuts and screws. Store them in the small plastic bowl. If you can't finish the job in one sitting, it might pay you to mark these parts as to where they came from. Sticking them on a piece of masking tape may help. Stick them together in groups. A tight-fitting cover for this bowl will help keep parts from getting lost.

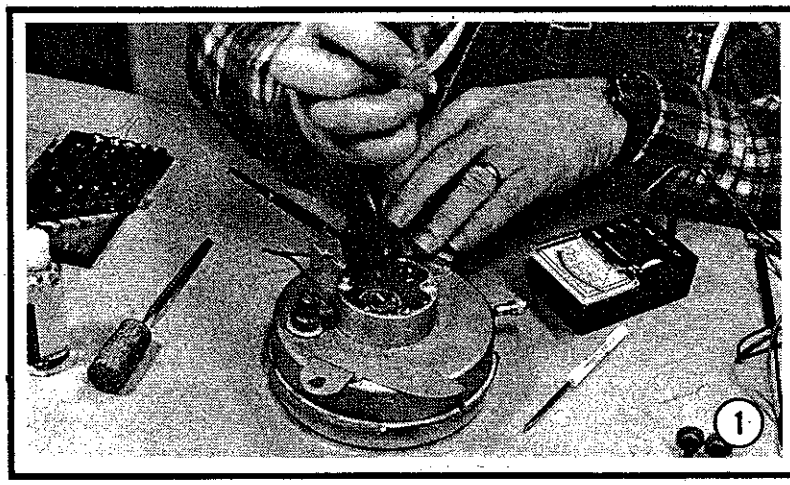

FIGURE 1 shows the removal of the case and terminal nuts. I know that dear old Dad said he'd flatten you if you ever used pliers to remove a nut, but there is little danger of rounding the corners here. Remove the nut that secures the grounding strap to the case. Remember which post you took it from. Also remove any and all screws which fasten the back of the case to the movement.

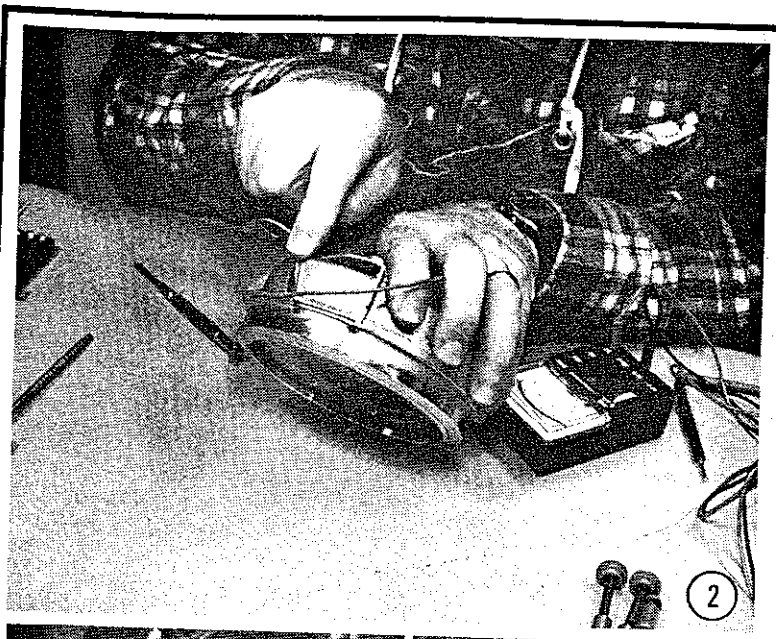

FIGURE 2 — Removing the Bezel — Figure 2 shows the process of removing the bezel assembly. The bezel is usually fastened to the case by means of crimped-over tabs. To remove the bezel, carefully uncrimp these tabs. Bend them as little as you can so as to avoid breaking them — just enough to get the bezel off with a little coaxing. Be careful when removing the bezel as the glass will come with it. Try not to break the glass as it is hard to replace.

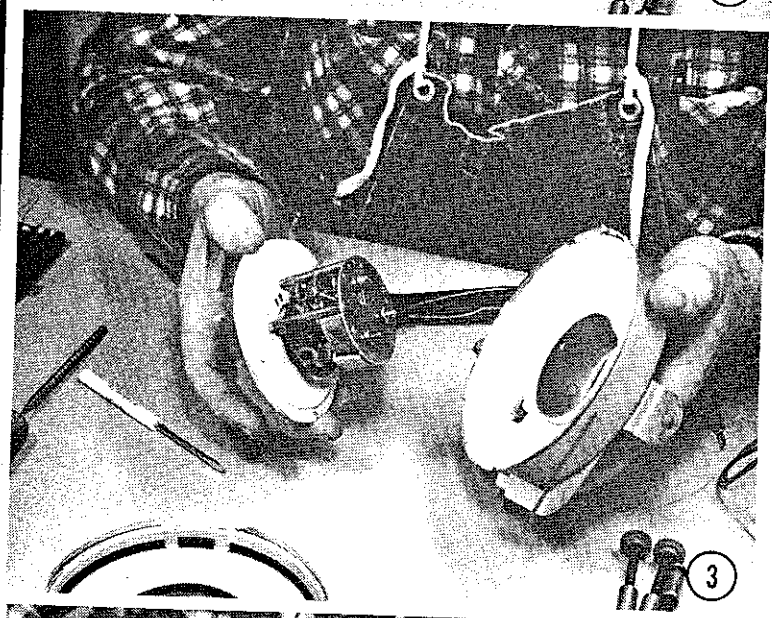

FIGURE 3 — Removing the Back — Once the bezel has been removed, you will be facing a scene as shown here. Here you can see the clock movement complete with rewind mechanism, fastened to the dial plate. In order to properly clean the clock the dial plate must come off. In order to remove the dial plate we must first remove the hands and the dial. Please don't be tempted to skip these steps.

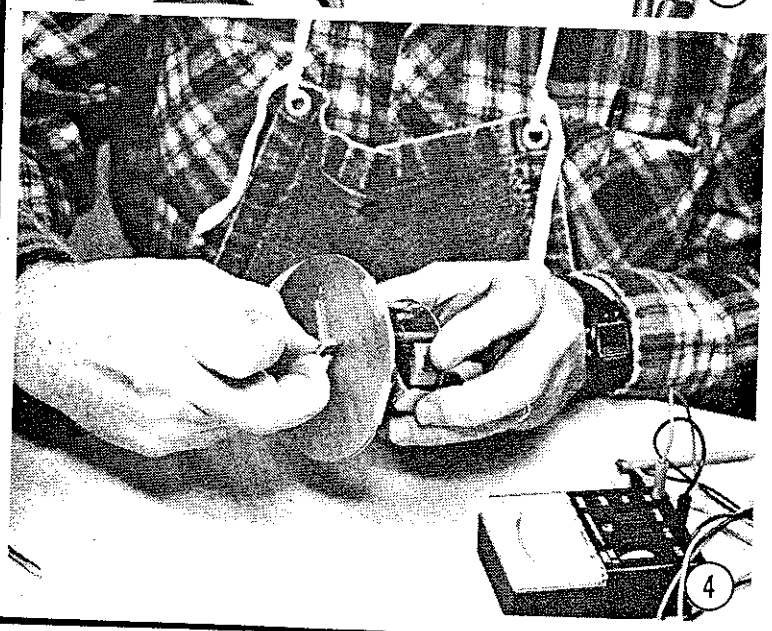

FIGURE 4 — Removing the Hands — Figure 4 shows the approved method of removing the hands. They are friction fit to the hand shaft (called the center shaft). Sometimes they are mighty tough to remove. Work carefully to avoid scratching the dial. If removing the hands is too tough for the fingernails, you can use two screwdrivers, one from each side, to pry them off. Once again, work carefully. It is a lot easier to avoid ugly scratches than to touch them up. Usually the dial is held on to the dial plate by three or four bent-over tabs. Pry these up carefully (for the same reason given before). Close examination of Figure 4 shows that the dial is held in place by Scotch tape. Someone has broken the dial tabs off this clock.

FIGURE 5— Removing the Dial Plate — Figure 5 shows the front of the clock with the dial removed. Notice that the dial plate is held to the movement by three screws and that these screws aren't placed symmetrically. This is to insure that the dial plate can be fastened to the movement in only one orientation. (Ah! The best laid plans, and all that sort of thing.) The dial plate can be reversed, front to back, and still fit. Pay attention or make notes here to avoid some misery later.

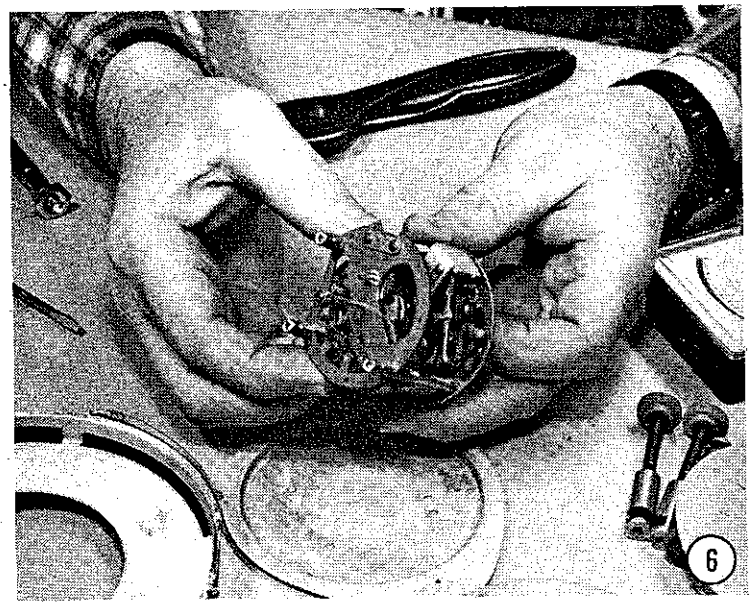

FIGURE 6 — The Rewinder/Movement Assembly — At last! We have finally reached the movement. Figure 6 shows the rewinder movement assembly. These two mechanisms are fastened together with screws (usually three) through the rewinder. Before you remove these, study the mechanism carefully. Note the position of the contacts and how the clock connects with it. Note how the movement of the rotor rewinds the clock. Make all of the notes and diagrams that you think you might need to reassemble these pieces, wait a while, and make some more. Try to understand how these pieces work, both separately and together. If you can't understand how it works, quit now and take it to a clock shop. I have little fear that people who restore old cars will have trouble with this, but this is the critical step. Once you have taken these two pieces apart, you are going to have to go through with the whole thing. Don't be frightened, it's really quite easy if you understand how it works. Okay? Remove the screws and separate the rewinder from the clock movement.

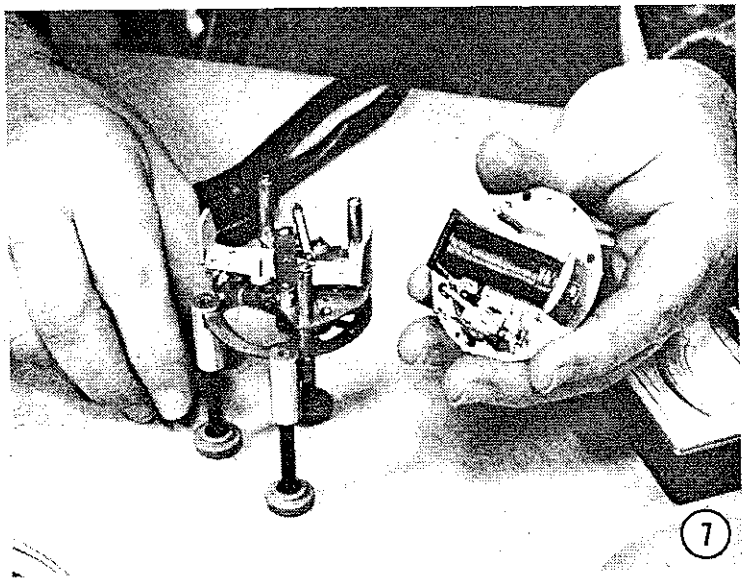

FIGURE 7 — Clock and Rewinder Separated — Figure 7 shows the separated mechanisms. On the right side of the photo you can see the rewinder with its coil and contact assembly. Put these aside for the moment. The clock movement is shown on the left side of the photo. You can see the movable rotor and the mainspring which is attached to it. It is the mainspring which provides the power to drive the clock. Elsewhere in the movement you will find a strange looking wheel with no teeth on its edge. This is the balance wheel. It is visible at the bottom of the movement in Figure 8 on the next page. Fastened to the shaft of the balance wheel is a fragile flat coil spring called the hairspring. Take great care not to put any undue forces on the balance wheel or distort the hairspring in any way. These are the very heart of your clock.

FIGURE 8 (LEFT) — The Clock Movement

FIGURE 9 (BELOW) — Making an Oiler — At this point you are ready to clean your clock; however, two things are missing. First, you will have to make your oiler, and second, you will have to mix your clock cleaning solution. Figure 9 below shows you how you can make an oiler from an old crochet needle. If you don't happen to have one, and Grandma has given up the sport to tool around town on her Yamaha, you can use a paper clip. The important thing is to end up with a small, flat spear point. Once you have made the oiler, and cleaned off the point, don't touch it with your fingers. Your body oils will contaminate the clock oil. Instead, keep it stuck in an old cork until you are ready to use it.

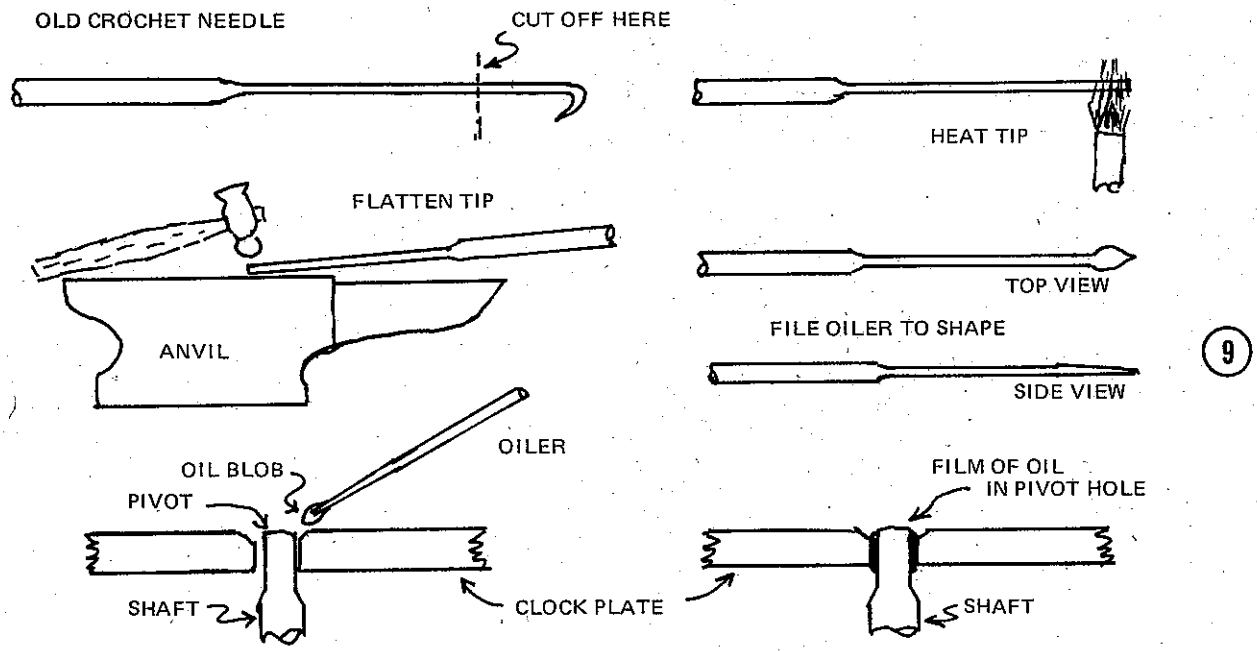

FIGURE 10 — Cleaning the Movement — When ready to mix the clock cleaning solution, it is best to do it outside where there is plenty of ventilation. If you bought the stuff I recommended, a good whiff of ammonia will knock you flat. Follow the manufacturer's instructions, and mix the solution in a gallon jug.

Place the clock movement in the bottom of the large plastic container and cover it with clock cleaning solution. DON'T put the rewinder in the solution. It will strip the insulation from the wire and ruin it. Let the clock soak for about five minutes (not much more).

After five minutes, gently brush off the movement with your paint brush. Be careful around the balance wheel and hairspring. If extremely dirty, you may have to brush the solution into the gears themselves. If stubborn lubricant remains in the pivot holes, use the toothbrush to remove it.

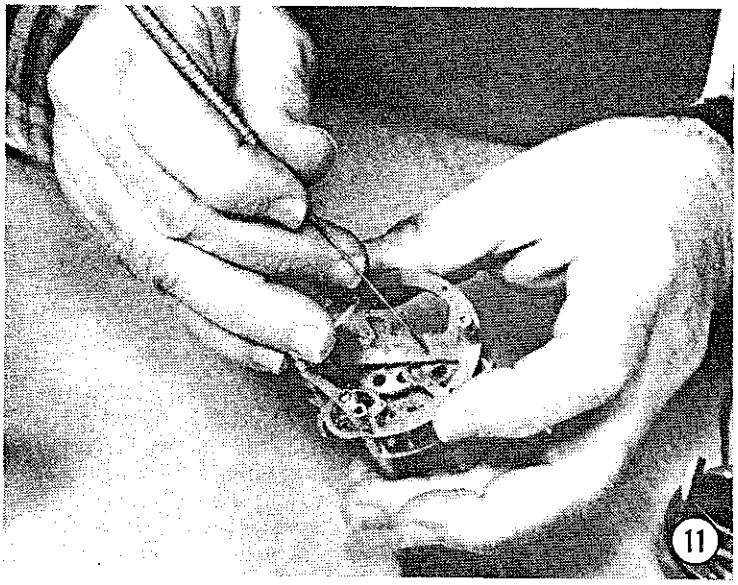

FIGURE 11 — Oiling the Clock — When the clock is at last clean, pour the solution back into the gallon jug and cap it tightly (it's reusable). Place the movement back into the large container and rinse it off for a few minutes under gently flowing hot water. When you are sure that all the solution has been washed off, remove it from the water, place it on an old towel, and blow it dry using the hair dryer. As an alternative, shake it off gently and place it in your oven (at no higher than 150 degrees) for about 15 minutes. The clock should be fully dry.

Now you are ready to oil your clock. The general rule for this is to put oil only in the pivot holes, not on the gear teeth, and never on the plates. Of course, there is an exception and we will cover this later. The pivot holes are those holes in the plates where the ends of the gear shafts come through. They are the bearings that the gear shafts turn (pivot) on.

Take your oiler from the cork and stick it into the clock oil so that a small drop of oil remains on the end of the oiler. Touch the tip of the oiler to a pivot hole and the oil should transfer to the hole. Put on enough oil so that the hole is filled but not so much that it runs out on the plate. If this happens, wipe off the run and re-oil that pivot. With a little practice, you will find yourself moving right along. Oil every pivot in this manner, both front and back.

FIGURE 12 — Oiling the Other Side — If you look closely at the balance wheel pivots, you will see that they fit into a couple of hardened steel cones. You will have to put some oil into these. This is pretty easy to do on the side away from the hairspring, but you'll have to be quite careful on the hairspring side — there isn't much clearance. If you get oil on the hairspring, you will have to reclean the clock. Oil on this spring will make two or more turns stick together, which will cause the clock to run fast — about an hour or two a day. Violating the general rule, you will have to put a small amount of oil on the teeth of the escapement wheel. This is the strange looking gear with teeth that look a bit like saw teeth. Put a small amount of oil on every third tooth.

Guess what! You have just finished oiling your clock. Now we can turn our attention to the rewinder.

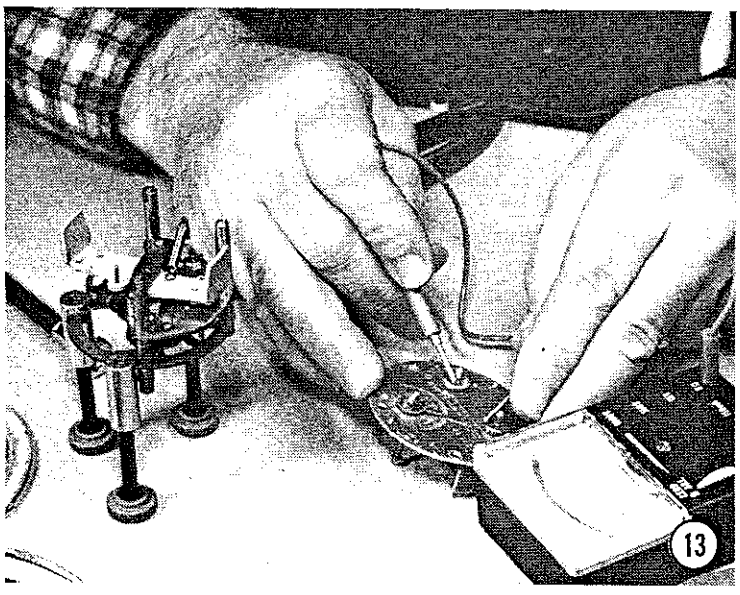

FIGURE 13 — Checking the Resistance — Examine the contact points very closely. If they are pitted, burned, or otherwise corroded, carefully burnish them until they are bright and shiny. Keep your fingers off the contacts to avoid future corrosion from body salts. Snap the contacts closed and measure the circuit resistance, at the wiring terminals, with your ohmmeter. You should get a reading somewhere between 10 to 100 ohms, depending on your clock. If you get a reading in the thousands of ohms, you have an electrical problem. One of your connections is bad. Resoldering all the solder joints with a small soldering iron should take care of this problem. If it doesn't, look for a broken wire (rare). If you can't find one, check directly across the coil; it may be bad (also rare).

At this point you can skip the next paragraph and go on to putting your clock into "Factory Fresh" working order, otherwise you can install an arc suppression diode (see Figure 14).

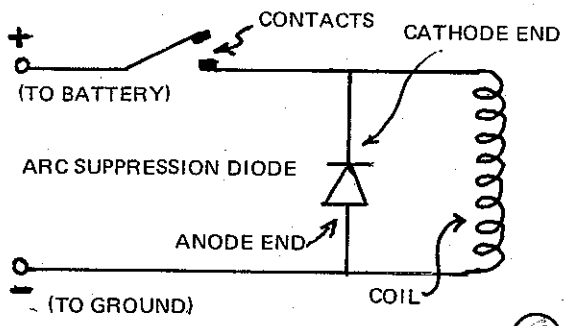

FIGURE 14 — Arc Suppression Diode Connections — An arc suppression diode will prevent sparking when the contacts open, thereby preventing the pitting and corrosion which arises from this cause. As the contacts open, the magnetic field which surrounds the coil when current is flowing collapses. This collapsing field passes through the coil and induces a large current in it. This will cause a spark to jump in the gap of the contacts and cause them to burn. This is exactly what happens in your ignition system when the breaker points open; however, to save the points the auto maker puts a condenser across them. The car clock makers aren't so kind. I have done some research and have concluded that either a 1N4004 or a 1N5404 silicon diode will do the job for you. Wire them in across the contact points as shown in Figure 14. The cathode (-) end of the diode must be connected to the (+) terminal wire. There are so many different styles, from so many manufacturers, that an explanation might be more confusing than it's worth, so to avoid confusion, ask the man who sells you the diode to show you which end is which. Be sure that the diode is located so it will not interfere with the mechanical workings of the clock or rewinder.

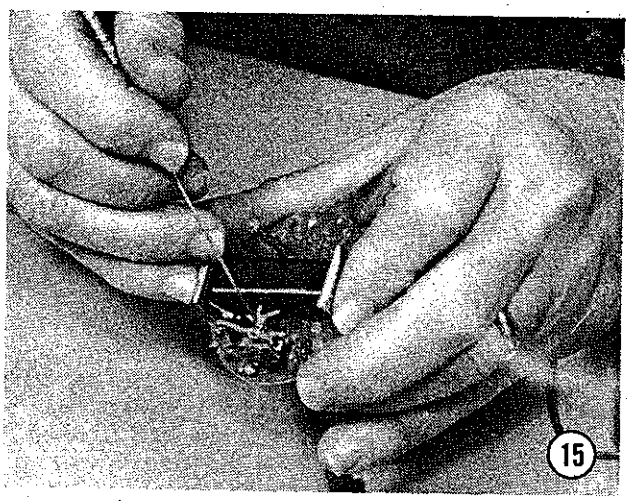

FIGURE 15 — Rewinder Lubrication — The last thing to be done before reassembly of the clock is lubrication of the rewinder mechanism. There is usually only one place that requires oiling — the contact post. Use your clock oil and oiler to lubricate the bearing post.

Reassembly

Now start the reassembly process. Mate the rewinder to the clock movement and fasten them together with the proper screws. Make sure you have fitted them together so that the action of the clock will snap the contacts together and that the rewinder will separate them. Also, be sure that you have properly mated the little ratchet and pawl device that allows the clock to wind in one direction only. You can check this by moving the rotor around and seeing that the mainspring stretches, and stays stretched, and the contacts will snap open. If all has gone well, at this time the clock will start to run. How about that! You have just repaired your first clock. CONGRATULATIONS!

Now refasten the dial plate to the movement, and fasten the dial to the dial plate. Remember to be careful with those tabs. Align the hour hand with an hour marking on the dial and press it onto its shaft. Press it on only just far enough so that it won't drag against the minute hand. Align the minute hand with 12 and press it on securely. Turn the time set knob and make sure that the hands turn freely and don't hit each other or anything else. Put on the back of the case and secure it as necessary. Mount the bezel and secure it with its tabs (once again, be careful).

If you have a battery charger, you can use it to check out the clock. Pay attention to the polarity, especially if you have installed the diode otherwise you may hear some silicon scream. The rewinder should click, and the clock should start ticking.

By golly, you have done it!

Brace yourself, put it back in the car, and enjoy many years of knowing that you got it running again.

By the way, you might be wondering what to do with your leftover clock cleaning solution and clock oil. They are, of course, good for cleaning and oiling other clocks and small instruments. The oil can be used on a variety of things around the house and garage that requires a very high grade oil. The solution does a marvelous job of cleaning any kind of metal part. You can store them away in a cool, dark place and they will keep for years.

If you have plowed your way through restoring your car clock and find that you have become hooked, come join my Clock Restoration Class. If it sounded a bit too complex and you would rather see it demonstrated before you tackle the job, come join my Antique Auto Restoration Class. I'll try to arrange a demonstration for you.

May your job go well, and you have pleasure from your hobby.