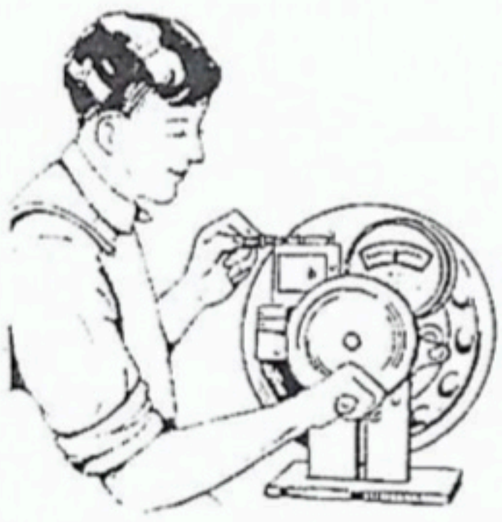


Adjusting The Coil Unit

Proper Adjustment Improves Engine Performance

By Murray Fahnestock

Anyone can adjust the Ford coil units so that they will work like a doorbell! But both care and skill are necessary to adjust the coil units so that the engine will run smoothly and develop maximum power, and the coils stay in reliable adjustment for the longest possible time.

Correct coil unit adjustment often makes quite a difference in the speed and power developed by the Ford engine. If one or more cylinders are a little late in firing (even though they do not misfire altogether), this destroys the smoothness and rhythm of the engine, and may easily mean a loss of twenty percent or more in power.

When correctly adjusted, the vibrator of the Ford coil unit vibrates at about 275 times a second, or 16,500 times a minute. When we remember that the wings of the bumble-bee buzz at only 240 times a second, we appreciate why the Ford coil units should buzz like an angry bee.

To make really good, firm electrical contact at such speeds, it is necessary that the tungsten "I" points be clean, smooth, and in correct alignment across the entire surface of the points, instead of just barely touching at one corner.

The contact points are made of tungsten, an elementary substance, not an alloy. The best ore, known as Wolframite, comes from China and the shadows of the lie Great Wall. The Chinese coolies gather the ore from the age-old and eroded hills and carry it in baskets, attached to poles slung over their shoulders. Another example of the increasing requirements of the Ford industries are sending trickles of wealth to the most remote corners of the world.

As tungsten is so brittle, it cannot lay riveted directly to the springs. Consequently, the tungsten pellets are soldered to the tops of flat-head iron rivets, the soft shanks of which are then readily spun into the contact springs.

The coefficient of expansion of tungsten is much lower than that of any other metal, being one-quarter that of iron. It is therefore necessary to use a suitable soldering medium for attaching the tungsten to the iron. Otherwise, temperature changes would cause the tungsten to crack, due too unequal expansion and contraction. Copper is the soldering medium, but great care is used to keep the amount of copper restricted within certain limits.

Cast iron melts at 2,786 degrees, while the hard-to-melt platinum (formerly used for contact points) melts at 4,100 degrees Fahrenheit. But the melting point of tungsten is not reached until 5,750 degrees is attained.

With such a high melting point, it is impossible to melt and pour tungsten like other metals, as no known crucibles are capable of withstanding such extremely high temperatures. This makes necessary quite unusual methods of forming the tungsten into rods. The ingots are heated to 5,200 degrees and then reduced to the proper shape and size by hot swaging, the working temperature being about 3,000 degrees. The swaged rods are dense, round rods of brittle tungsten of proper diameter for the contact points. Owing to the hardness of the metal, they can only be sawed up into pellets of the proper thickness for contact points by abrasive cutting discs, rotating at high speeds.

When smoothing burned contact points, it is not necessary to keep filing down the metal until all the depressions have been eliminated, It is only necessary to file off the projections, until the points have been made smooth and level, and contact can be made over 75 percent or more of the surface of the points.

If there is only a small pit in a contact point, and one attempts to file down the metal until this depression is entirely removed, much good metal may be ground away and the life of the contact point shortened. Furthermore, when much metal has been removed from the points, it is difficult to secure a satisfactory spring tension adjustment.

It is hard to file the coil points true and smooth, while holding the coil unit in the hand. So it is preferable, as a rule, to clamp the coil unit in a vise while truing the points.

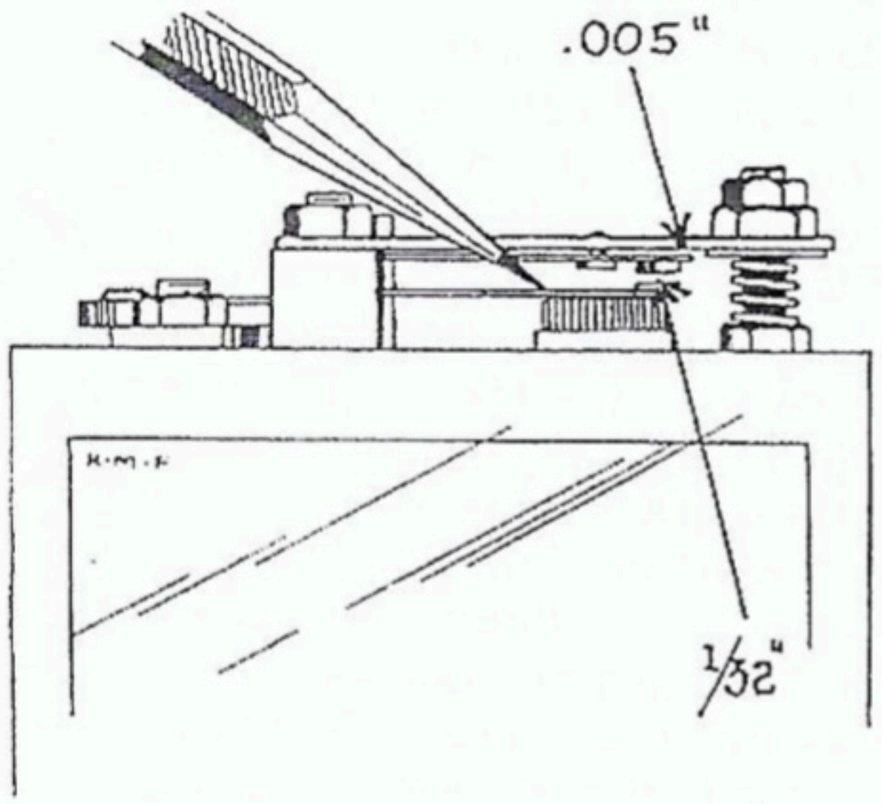
When gripping the coil unit in a vise, care should be taken not to put too much pressure on the sides of the coil unit. Placing a couple of thin boards between the sides of the coil unit and the vise jaws is a precaution taken by some repairmen.

When filing the coil points, use a special, thin

flat file, or a carborundum stone that is made for this purpose. Use one hand at each end of the file, so as to produce a smooth, true surface. The file can be made to cut both upper and lower contact points at the same time by turning the adjusting thumb nut so that the file is lightly gripped between the two points.

ADJUSTING COIL UNITS

1. Inspect the tungsten points of both vibrator and bridge. If the points are badly pitted or burned, a new vibrator and bridge should be installed. If only slightly pitted, they can be removed and dressed down with an oil stone.



As a complete set of points for an entire set of Ford coil units costs the car owner but 80 cents, and as a properly adjusted set of points should give from six months to a year or reliable service, it is usually better to install new points—and adjust them carefully.

2. When installing new contact points, it is very important that a uniform clearance of approximately .005 inch be maintained between the cushion spring, on which the upper contact point is mounted, and the bridge. This clearance should extend the full length of the cushion spring.

3. With the vibrator and bridge held open, adjust the gap between the coil points to 1/32 inch. The adjustment is obtained by loosening the lock nut and tightening or loosening the larger or adjusting nut on the threaded post.

4. The tungsten points should meet each other fairly and squarely when they come together. The alignment of these points is very important, both crossways and lengthways with relation to the top of the coil unit.

Correction for misalignment of contact points is made by loosening the nuts holding the bridge and vibrator assembly, and moving these parts until the vibrator point is squarely under the bridge point. Then the four lock nuts on top of the coil unit should be drawn down tightly with the SpinTite socket wrench, which we have found very useful for this purpose.

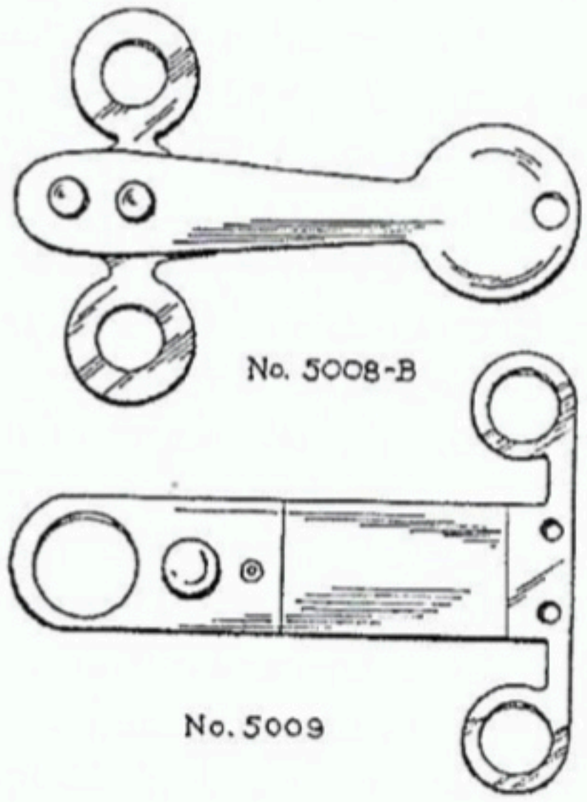
When making contact point alignment adjustments, either the vibrator spring or upper bridge may be moved. If the upper bridge is moved, be sure that it does not touch and short-circuit on the metal post from which it is supposed to be insulated by the fiber washers above and below the bridge.

If the contact points are not in exact alignment with each other, they will touch only along one side or at their corners. Under such conditions. these corners will soon be hammered and burned away, and the jagged edges will tend to fuse or melt together, causing sticking of the coil points and ignition trouble.

The alignment of the coil points is worthy of much more careful attention than is given it by many repairmen. For when the points are in contact across their entire surface, the heat and wear are distributed and the hammering has but little effect on the points.

TESTING THE COIL UNIT

Place the coil unit in a coil tester and revolve crank at about 160 revolutions per minute, at which speed the Ford magneto should deliver about 6 volts.



Adjust vibrator tension until the ammeter registers 1.3 amperes. A uniform reading of 1.3 amperes should be obtained on all four coil units. To increase the amperage, lightly tap outer edge of vibrator bridge with a small hammer. To lower the amperage, slightly pry up the outer edge of the lower bridge. Either a special hammer or a screw driver can be used for this purpose.

When a coil unit is correctly adjusted, it will show one good spark at each of the 16 points around the ring, with the ammeter on the stand registering 1.3 amperes, and the volt meter registering six volts.

To Rebuild a Coil

Inside a Coil

A study of Figure 1 will help explain the process—Start at the contact at the bottom of the coil. When the ignition is switched on to the battery position a flow of positive current issues each time the commutator roller or brush touches one of the four timer segments permitting that current to pass through to the engine and chassis thus grounding and completing the circuit back to the negative post of the battery. At the same time this same current passing through the primary winding of the magnet inducing a high voltage in the secondary winding out of the contact marked 'spark plug' on the diagram and down the centre ceramic-encased electrode of the spark plug, bridges the air gap (0.025") and grounds itself through the metal surround of the plug and thus to the grounded side of the secondary coil.

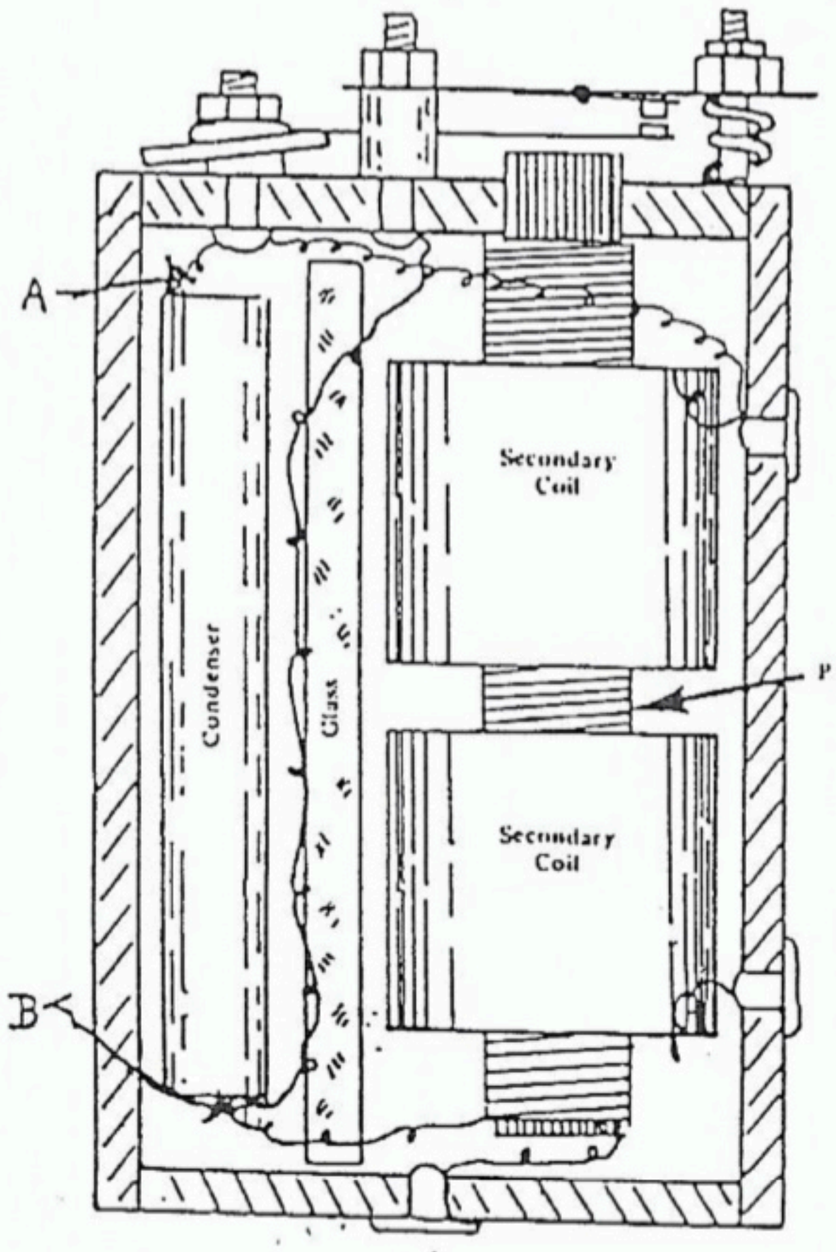
The induced voltage in the secondary coil is what is critical for coil efficiency. The faster the coil points make and break during the instant that the roller touches the timer segment thus sending current to the primary coil (and instantaneously charging the secondary coil) the higher the voltage output of the secondary coil, and the hotter the spark. The spark is in the range of 8,000-10,000 volts with a current of 1.2 or 1.3 amps.

Sparking Problems

1. If the vibrator points spark and there is no or a very weak spark at the discharge gap (E on Figure 4) then (i) the condenser needs replacing (test by shunting as mentioned above), or (ii) the secondary windings are faulty and the coil must be retired from active duty.

2. If there is no vibration at the points and the ammeter flies across the dial there is a short in the primary winding. Retire the coil altogether. OR (ii) the points are at fault and have been tightened down too tight and are touching thus shorting out. Re-adjust the clearances.

3. If there is no vibration at the points and the ammeter is dead, check them for clearances etc., and if still no response, the coil is useless.



1

1. Remove old points, all nuts, spring, and insulator.
2. Clean top and all contacts with wire buffer.
3. Remove back of coil.
4. Carefully clean the pitch from around capacitor.
5. Remove glass or wood insulation.

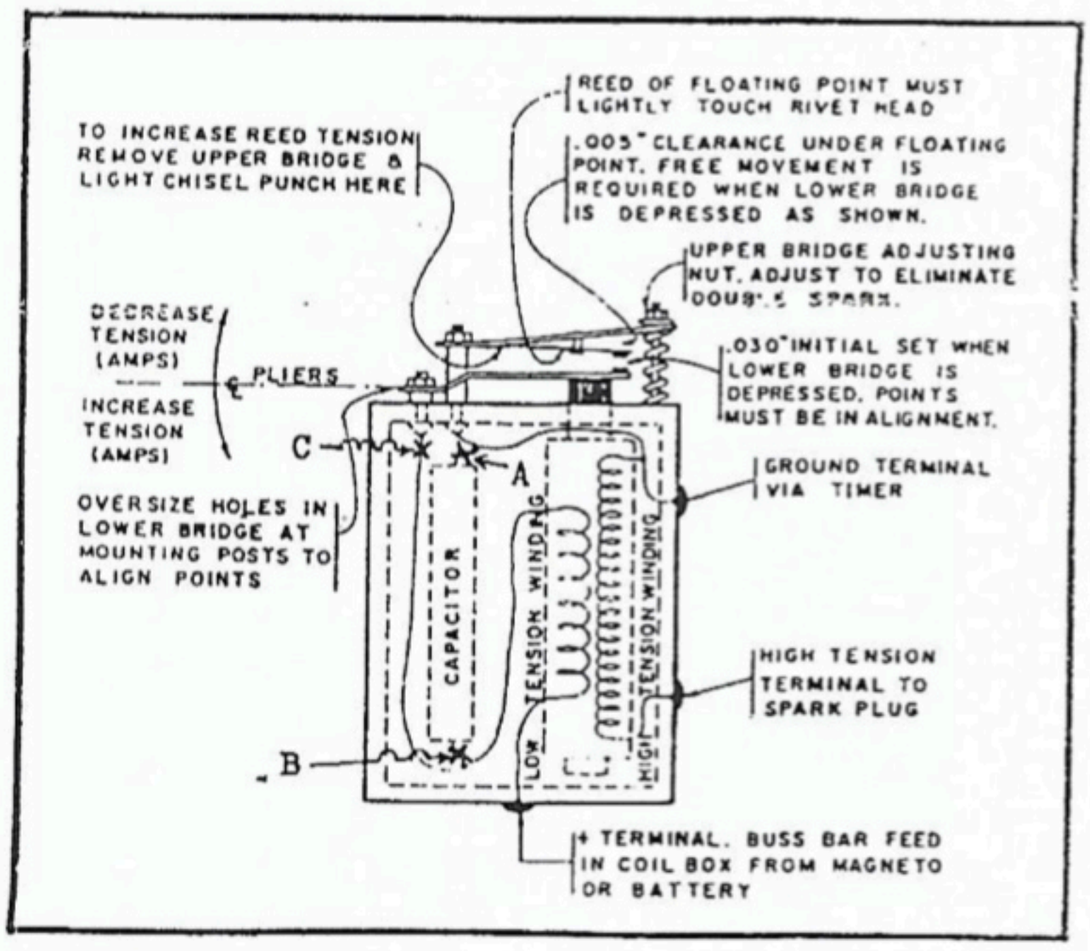
6a. *Old original coils* have a long aluminum capacitor. Break out old capacitor, leaving top and bottom attached to their wire leads. Cut off bottom of capacitor at point B. This leaves two wire leads. Attach these to one lead of the capacitor and solder.* Cut off top of capacitor at point A. This leaves one wire running to post of vibrator. Attach wire to other end of capacitor and solder.* (I use DIFILM Mylar-paper radial lead capacitors, Sprague Orange Drops .47MF 600WVDC [illegible])

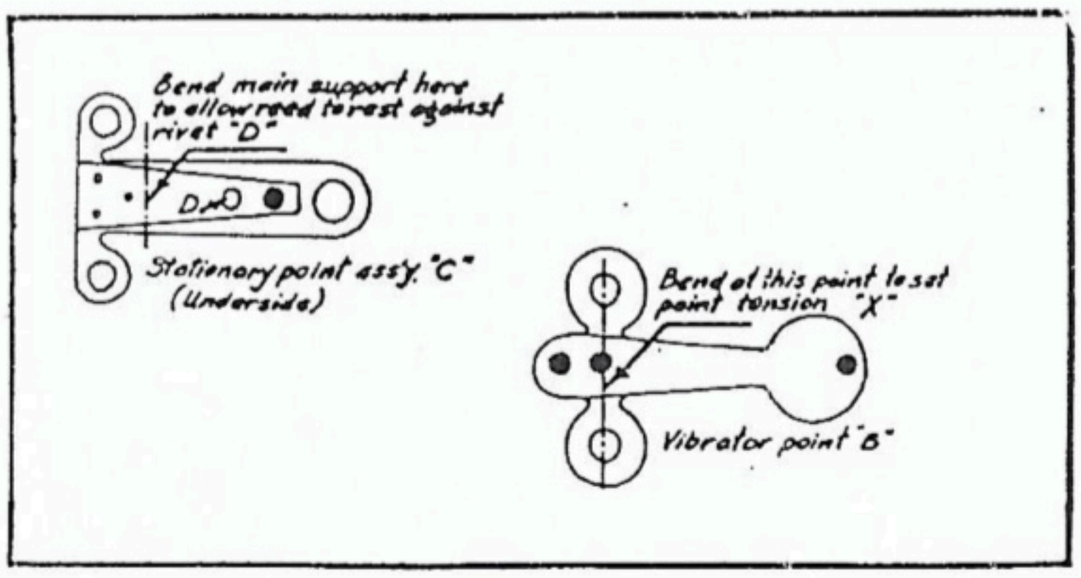
b. *Late coils made in 50s.* Cut wire coming to top of capacitor and bottom of capacitor. Solder* new capacitor to leads (same capacitor as above).

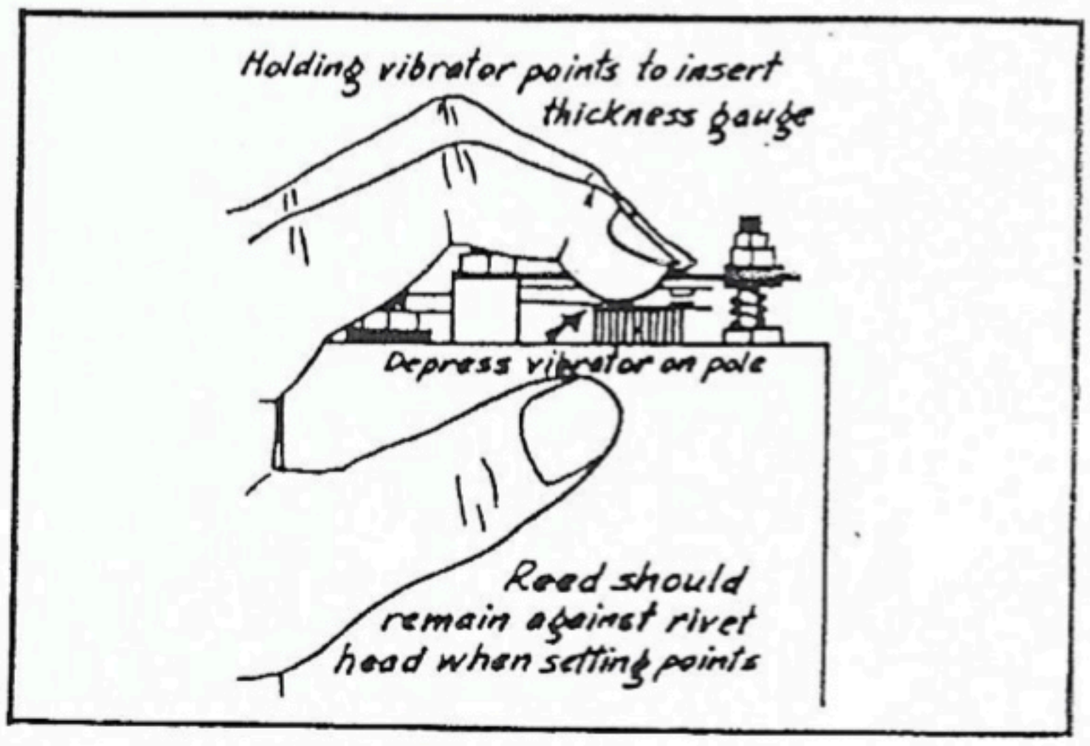
* Prior to soldering, it is good to replace points and vibrator and test coil with wires from a battery. Some coils cannot be rebuilt, and it is better to find out prior to soldering in the capacitor.

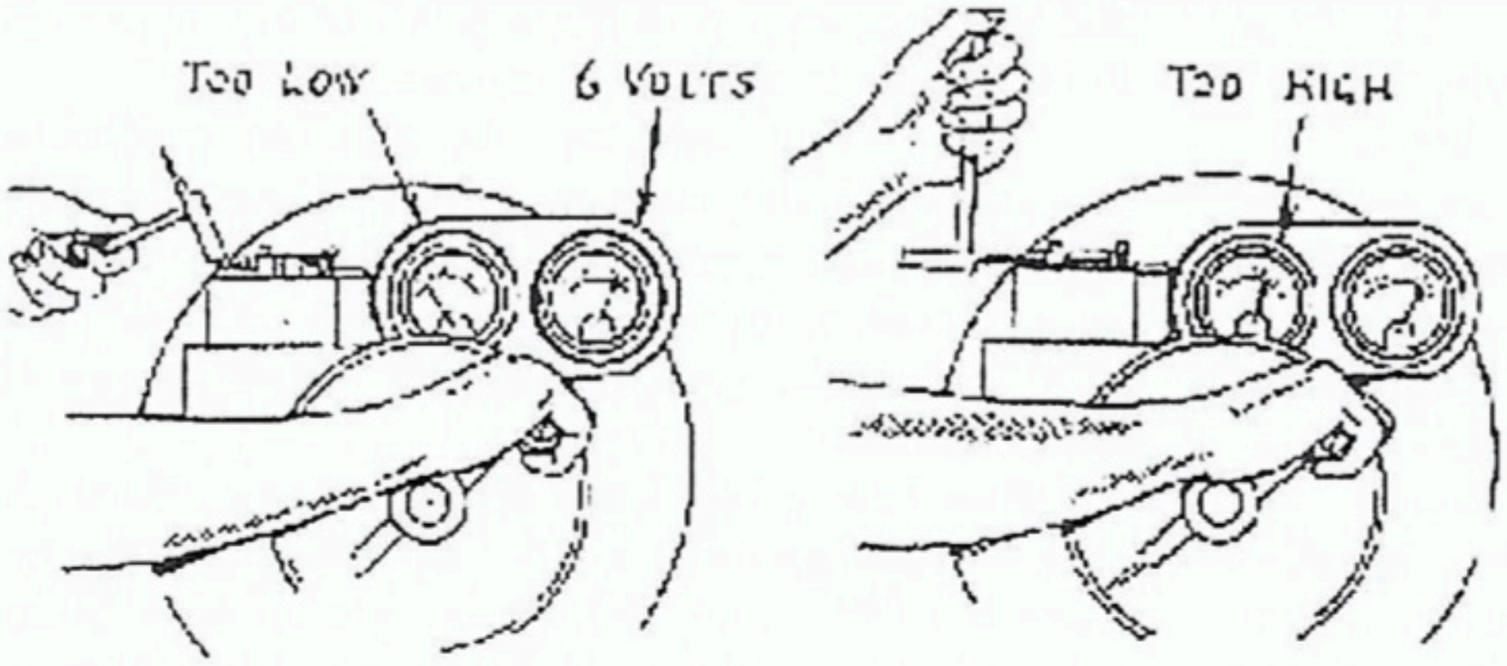
7. If coil works, you can adjust later. Fill all area around capacitor with canning wax, let cool, replace side, and adjust as described in the Ford Manual.

From The "Vintage Ford" Model T Ford Club of America





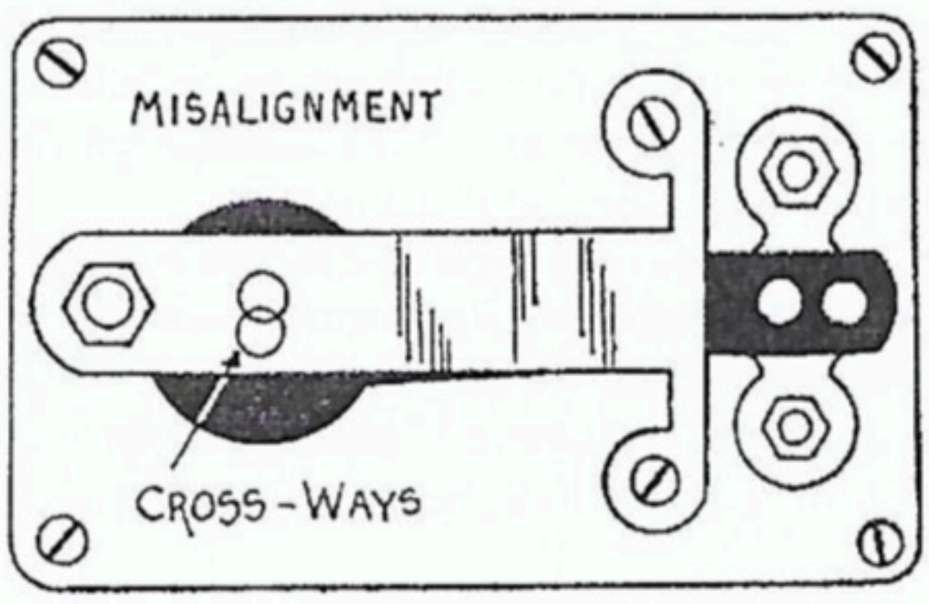




Adjusting the coil units

If more than one spark occurs at any of the sixteen points, this indicates that the cushion spring is not working freely. This can be corrected by lightly tapping the vibrator on the cushion spring rivet.

If only a very weak spark, or no spark at all shows on test ring on stand, after dressing down or installing new points, and adjusting coil unit as outlined above; the trouble lies in the interior of the coil and must be located and, if possible, repaired, according to instructions to be given in another story. Many Ford repairmen find it easier to install a new coil unit than to attempt to repair a damaged coil unit.



ADJUSTING THE COIL UNITS

Before replacing the units in the coil box, see that the contact discs on the back and bottom of the coil units are clean. The contact discs may be cleaned by lightly scraping, or by rubbing them with steel wool or fine sand paper.

VIBRATOR BRIDGES

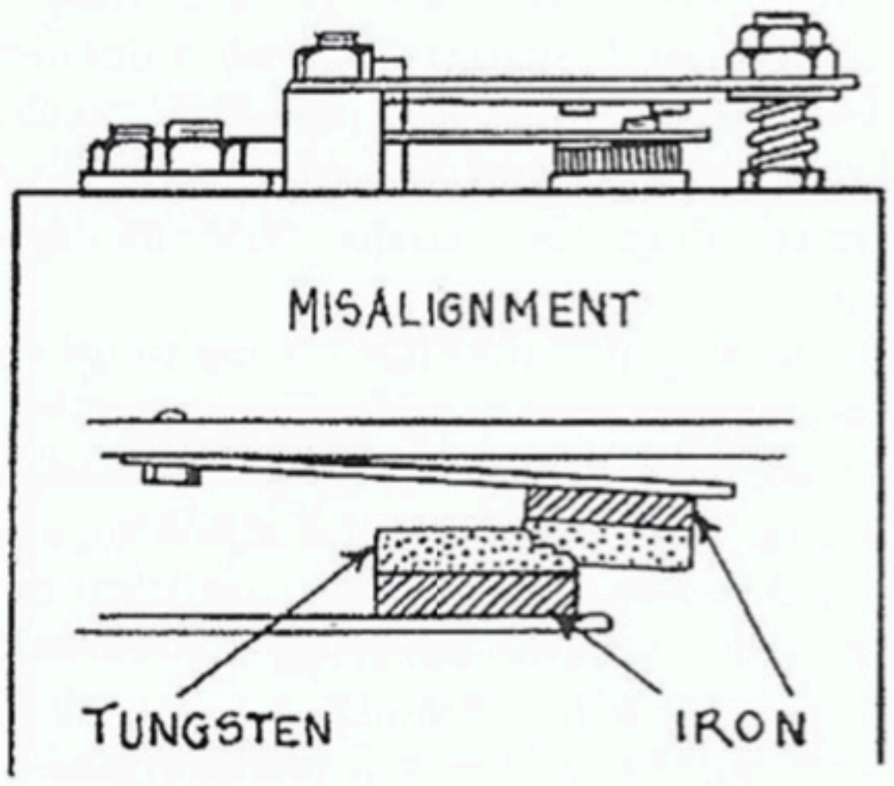
The vibrator bridge with tungsten point, part No. 5009, is made of brass about 3/64 or .0468-inch thick. To this bridge is spot-riveted a light steel or bronze spring, called the *cushion spring* on which the tungsten point is mounted.

There should be .005 inch clearance between the cushion spring and the bridge. The purpose of the cushion spring is threefold:

1. To keep the points together long enough for the current to more fully build up the magnetism of the coil.

2. The cushion spring causes the upper tungsten point to follow the lower point, until the lower spring vibrator picks up speed. Then the separation of the points is made with a quick, sharp *snap*. The sudden opening of the circuit breaks down the magnetism of the coil more quickly, resulting in a hotter and better spark at the spark plugs. The quicker break also means less sparking and pitting of the tungsten points.

3. The cushion spring provides a slight wiping action, which tends to clean and polish the tungsten points, from which we discover that the cushion spring should be pressing against the head of its rivet stop, when the tungsten points are not in contact.



One should he able to see light between the vibrator bridge and the cushion spring to which the upper point is fastened—thus showing that there is the correct .005 inch clearance between the cushion spring and the bridge. This clearance should be checked by means of a thickness or feeler gauge.

VIBRATOR SPRING

The vibrator spring, with tungsten point, part No. 5008-B, is made of Armitage or clock spring steel, which is heat-treated to increase its tensile strength and resiliency. An interesting detail of the method of manufacture is that these vibrator springs are cut lengthwise of the *grain* of the rolled steel, thus reducing the possibility of

fatigue of the metal and breakage.

The new design vibrator, No. 5008-B is a decided improvement over the old style, in that the steel vibrator spring is riveted to the bridge instead of being fastened by two screws, as in the older type. This arrangement makes it much quicker to remove and replace, as the same wrench that fits No. 5009 vibrator bridge with tungsten point, also fits the two nuts that hold the vibrator spring assembly No. 5008-B in place.

The vibrator springs are .0156 inch or l/64 inch thick. This is convenient to remember when using these springs for thickness or feeler gauges. Two springs, placed together, will give the exact 1/32 inch which is the correct distance that the coil spring should be set from the core.

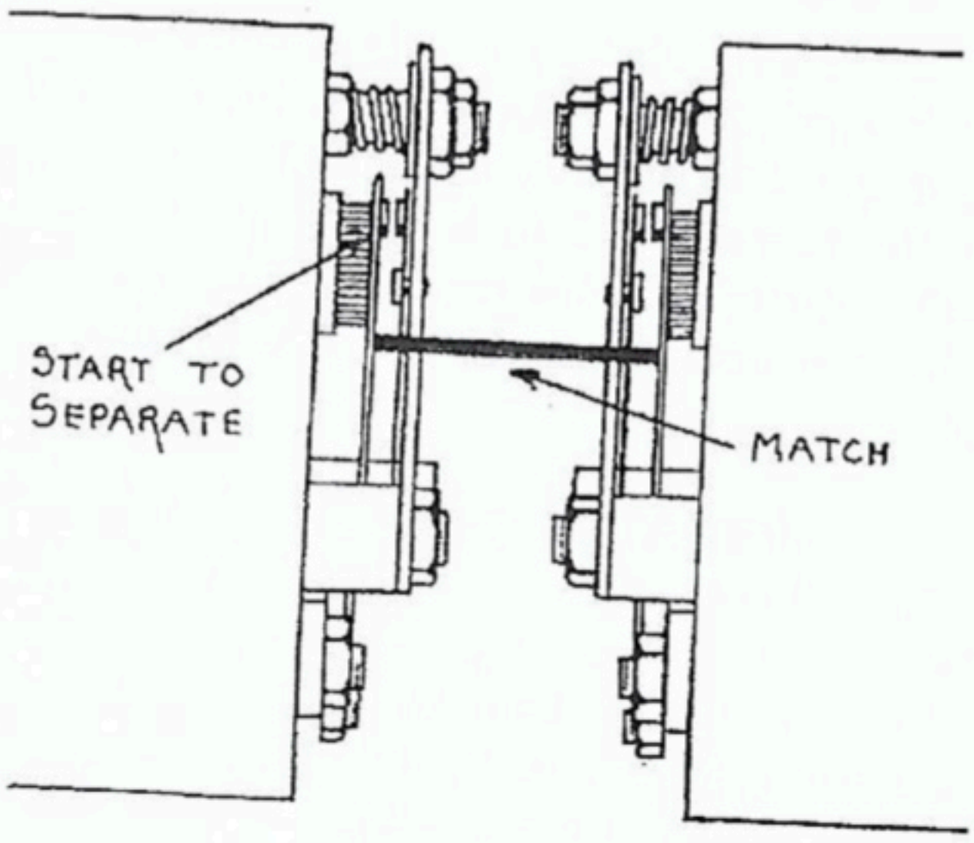
Since magnetism varies with the square of the distance, it is very important that the distance between the spring and core be correct. Suppose that it takes 2 amperes to start the spring in motion at a distance of 1/32 inch. Now, let us place the spring at a distance of 3/32 inch, or three times as far. Instead of requiring just three times as much magnetism, we must *square* the force, so that nine times as much current is required! Quite a difference, isn't it?

ROUGH AND READY ADJUSTING

Since a coil unit testing machine is not always available for roadside repairs, the Ford mechanic or trouble shooter should know how approximate adjustments may be made without special equipment.

One way of making rough-and-ready adjustments is to turn down the larger nut on the adjusting post, until that cylinder just begins to fire regularly. Then to tighten the adjusting nut an extra turn. After this adjustment has been made, the lockout (on top of the adjusting nut) should be tightened so that the adjusting nut cannot shift. thus destroying the accuracy of the adjustment.

Much trouble with Ford coil units is due to carelessness in neglecting to replace or tighten the lock-nut on top of the adjusting nut when the Ford coil units are being adjusted.



Rough Spring Tension Adjustment using a match between points

When a coil unit test stand is not available, one may get the tension of the vibrator spring approximately correct by adjusting the vibrator to a distance of about 7/32 inch (almost 1/4 inch) above the core, when the upper bridge is removed.

After one coil unit has been correctly adjusted. it can be used as a pattern for adjusting the others. Place the previously adjusted unit on a table or flat surface, and place the top of another coil unit towards the top of the first coil unit.

Place the match between the vibrators of the two units. Now adjust the second coil unit, so that the points of the two coil units just begin to separate at the same time, as the two coil units are slowly sliding towards each other.

Use the coil unit first adjusted as the model coil for adjusting each of the other three coil units. Then all four coil units will harmonize with each other in their rate of vibration, thus giving a smoother-running engine.

Adjusting Earlier Coil Units

The spring tension of earlier Ford coil units was adjusted by a tiny headless screw (Ford part No. 680), sometimes referred to as the *grub* screw, which was concealed under the rear end of the stirrup of the lower bridge. As this screw was covered up by one of the screws holding the vibrator to bridge, many Ford mechanics did not know of its existence or purpose.

Since the new type of vibrator spring (with bridge assembled) costs no more than the spring alone, the new type should be installed on all Ford coil units, thus bringing them up to date. Then they can he adjusted in the usual manner.

COIL UNIT ADJUSTING TOOLS

Small tools required for the quick and accurate adjusting of coil units in the Ford service station include (in addition to the necessary coil unit testing machine):

a. Gauge 1/32 inch thick for setting clearance between points.

b. Open end wrench for lower nut.

c. Bridge spring tool for adjusting cushion spring.

d. Stevens Spin-Tite wrench for small nuts.

e. Special hammer to drive down and pry up the vibrator support.

f. Thin, flat, file, or carborundum stone. ❑

Note: For more information on adjusting coils, refer to the Club's *Electrical Manual* and to the Restoration Video series, Series 3, tapes I, II, and III. You can find ordering information on pages 5 and 46 in this issue.