LABORATORY TESTS FOR FORD CARS

STROBOSCOPE SUPPLEMENT

◆

PREPARED BY
The Editorial Staff of
Ford Dealer & Service Field Magazine

◆

Copyright 1937 by
Trade Press Publishing Company
Milwaukee, Wis.

Printed in United States of America

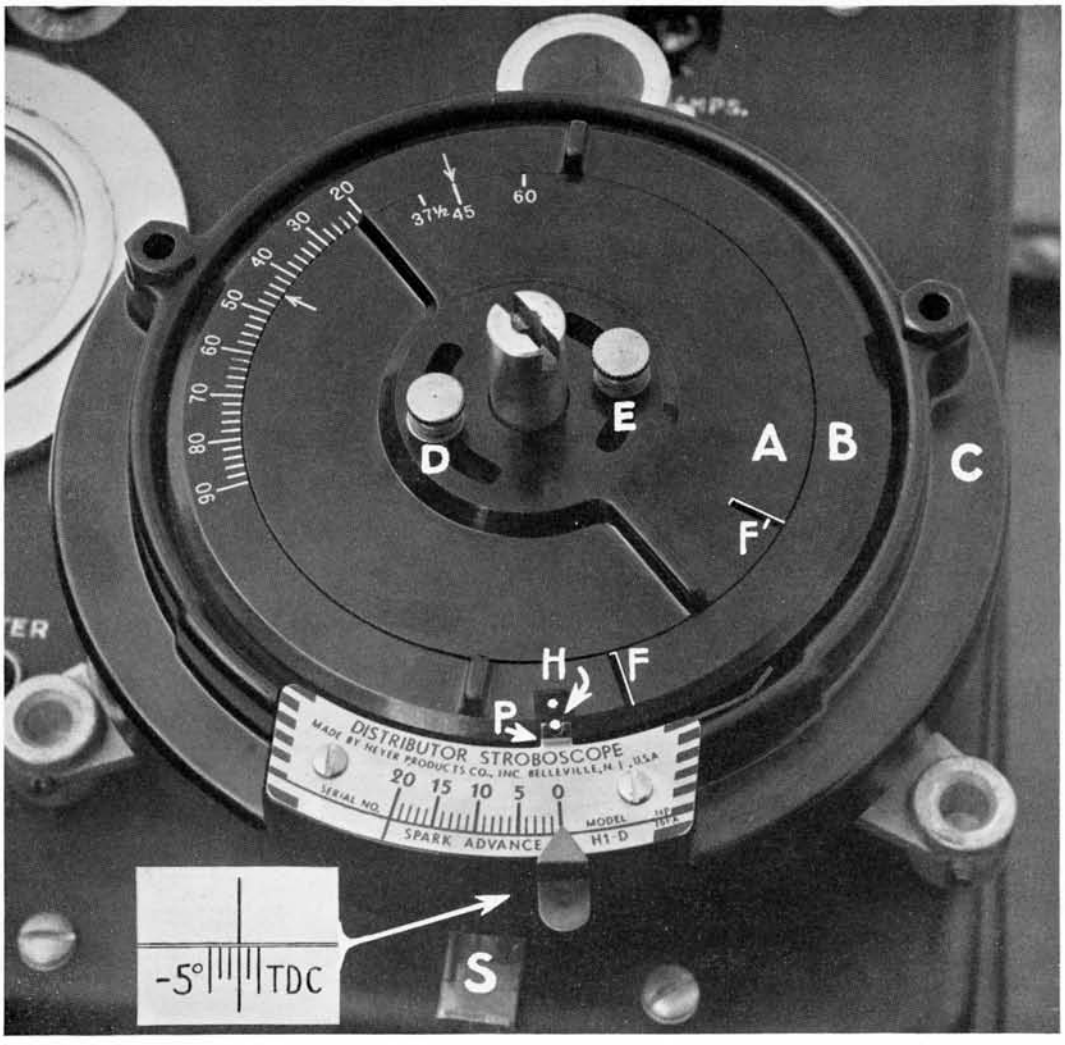


Fig. 1

Author's Note

The Stroboscope attachment for the Heyer Laboratory Test Set has only recently been made available to Ford dealers. Therefore, the instructions offered in this Stroboscope Supplement did not appear in the first edition of our book, "Laboratory Tests for Ford Cars".

This Stroboscope Supplement is intended to be used in conjunction with the book, "Laboratory Tests for Ford Cars". Frequent references are made to pages in the original book.

This Supplement has been bound in a convenient size so that you can make a pocket on the inside back cover of your copy of "Laboratory Tests for Ford Cars" and keep the Supplement always with the mother book.

THE STROBOSCOPE

A Standard Dictionary describes a Stroboscope as follows:

"An instrument for observing or studying periodic motion, as rotation or vibration, by rendering the moving body visible only at certain points in its path, as by throwing light upon it at intervals or by observing it through moving apertures."

The name itself comes from two Greek words: Strobos—twisting and Skopos—a watcher.

* * * * * * * * *

By connecting the output of a coil to a neon tube beneath the rotating disc of the Stroboscope, the operator can readily see, by the flashes of light, whether the cam and spring action of the distributor are correct. Spark Advance can also be checked as well as Timing.

The Figure on the opposite page shows the disc of the Stroboscope. Parts A & B rotate with the distributor. The portion C is stationary.

By loosening the thumb-screws D & E, the central portion A can be moved in relation to the portion B and locked at any desired angle indicated by the white arrows.

F & F' are two slots in the rotating portions which allow light from the neon tube to show through.

An eight-cylinder distributor gives eight sparks per revolution of its **own** shaft. Thus, a spark should occur every 45°. So, with the coil connected to the neon tube, one revolution of the distributor should cause eight flashes of light to show through the slots—both slots.

By setting the slots 45° apart, and speeding up the Stroboscope, flashes of light will occur faster than the eye can follow. By looking at one place on the disc—which runs anti-clock-wise—the operator first sees a flash through the slot F' which is immediately followed by a flash seen through F. The second flash actually occurs 45° later than the first but the movement is so fast that the operator sees both slots apparently lighted at the same time, one long line of light being made.

Thus, a stroboscopic effect is achieved and its usefulness lies in checking the distributor shaft for running true, the cam for accuracy and the breaker-spring for proper operation. So long as the lines of light are opposite each other everything is in order but, if they do not "hit" regularly, something is amiss. It is necessary to watch carefully at each of the eight places on the disc where flashes occur. Faulty cam or spring action will show up by flashes occurring irregularly, that is, not opposite each other. A bent shaft will show up in a similar way.

In the instructions received with the Stroboscope, reference is made to the correct setting of the Timing Mark and graduations at the base of the Stroboscope. Before locking the stationary portion of the disc

assembly in place, set the two long marks opposite each other. (See insert on Figure 1.)

Note on the Figure, the two small holes at H through which light can also show. Note also the movable Peep-sight P.

When operating the Stroboscope, see that the Slide S is pulled out. This will keep the Interrupter Breaker-points off the cam (beneath the Stroboscope) and allow free running.

When ordering a Stroboscope, the Heyer Company will supply complete parts for its installation. On Sets built prior to the introduction of the Stroboscope, there are two extra parts to be installed in the Set itself. These will be shipped by the Heyer Company automatically as they have a record of Serial numbers in Dealers' hands. More recent Sets have the parts built in. They are as follows:

1. A Carbon-pile Motor-Generator Rheostat for better control of the Motor Generator.
2. A Resistor unit to be installed in series with the Dwell Test Rheostat.

Full instructions for their installation accompany the shipment.

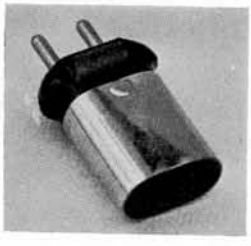


Fig. 2

Figure 2 shows a Plug for insertion in the % Dwell socket on the Set during most of the tests. This permits the operation of the distributor through the % Dwell Rheostat with the Black Interrupter lead in series with the Low Tension leads **regardless of the position of the Meter Jack.**

The Resistor in series with the % Dwell Rheostat is to protect this circuit.

When testing % Dwell as described on Pages 22 & 23, the distributor is on the car and the test is made through the Coil. The circuit is an inductive one and causes considerable falling off in the reading at speed. With the Stroboscope, connection is not made to the terminal of the Coil but to the "hot" side of the Condenser which leaves the Coil out of the circuit. Thus, the circuit is non-inductive and a similar falling off in the reading does not occur. This explains the large variation in Dwell Test readings on the car and on the Stroboscope.

To make connection to the Condenser terminal on all distributors prior to the "78", the screw at the "hot" end of the Condenser is removed and a special screw is substituted to which the Low Tension Lead may be clipped. (See Figure 3.)

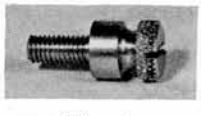


Fig. 3

In the following instructions "Left" and "Right" are from the viewpoint of the **driver.** NOT as the distributor is seen on the Stroboscope.

Since the Stroboscope enables the operator to achieve really accurate setting of the distributor, breaker-points are now available through Service.

TESTS.

Following are the tests which are carried out on the V-8 and Lincoln-Zephyr distributors:

1. **Adjust % Dwell on V-8**
2. **Adjust % Dwell on Lincoln-Zephyr**
3. **Test % Dwell at High Speed (V-8 & L-Z)**
4. **Check Resistance and Continuity of Coil Primary (V-8 & L-Z)**
5. **Set Distributor Timing & Check Spark Advance (V-8 & L-Z)**
6. **Synchronize Distributor (L-Z)**
7. **Observe Stroboscopic Image (V-8 & L-Z)**
8. **Check Coil Output at 20 MPH (V-8 & L-Z)**
9. **Check Top-speed Coil Output (V-8 & L-Z)**
10. **Adjust Vacuum Brake (V-8 & L-Z)**

In all Tests, except 8 & 9, the Plug illustrated on the opposite page is left plugged into the % Dwell Socket and, in every test in which it is used, the Black Interrupter lead and the Black Low Tension are clipped together.

Before proceeding with any test and **before installing the plug,** TEST THE BATTERY IN THE SET. It must read 6 Volts or over. A low battery will affect all tests and give inaccurate results.

Be sure that the slide S at the base of the Stroboscope is pulled out and that the Timing Marks shown in Figure 1 are properly lined up.

1. ADJUST % DWELL ON V-8.

Install distributor on Stroboscope fixture.

REMOVE VACUUM BRAKE. (Leave it out until Test 10.)

Clip Black Interrupter and Black Low Tension together.

TURN RHEOSTAT ON SET CLOCKWISE UNTIL IT STOPS.

Insulate the right-hand points. (Right on car)

Note:—Use a thin card or, preferably, a thin strip of celluloid. Do not insert while distributor is running otherwise the points may "nibble" off some dust and insulate themselves for further tests. Insulation is shown at A on Figure 4.

Plug Meter Jack into MPH.

Set speed at 20 MPH. Leave running.

Change Meter Jack to top of Plug in % Dwell Socket.

Ground Red Low Tension to distributor case and adjust % Dwell reading to 100 on Scale B.

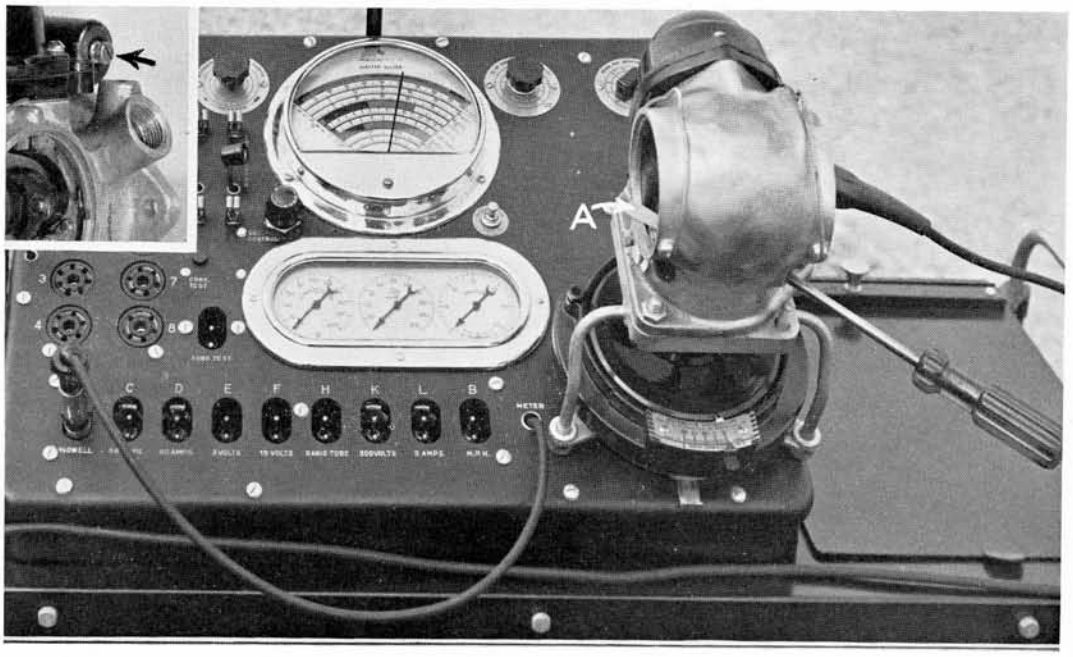


Fig. 4

Note:—Adjustment to 100 is made with the distributor running otherwise there would be a drop in the reading when started up because of the additional load on the battery.

NOW CHANGE THE RED LOW TENSION TO THE CONDENSER TERMINAL. On distributors prior to "78", use the special screw. Fig. 2. (See insert on Fig. 4.)

The right points being insulated, the reading indicates the Dwell of the left points. These should be adjusted with a screw-driver to **60** for distributors prior to "68" and to **50** for "68" & "78".

Figure 4 on the opposite page shows the test at this point.

Still maintaining the 20 MPH speed, remove the insulation from the right points. This will bring both pairs of points into action and an increase in the reading will result.

Now adjust the right points to give a **combined** Dwell of 80 for **all** V-8 distributors.

The breaker-points have now been set **electrically.** They have been set for correct saturation of the coil. They may not be exactly to specification if checked with a feeler gauge but the results they give **electrically** will be correct.

Setting may now be checked further by insulating the left points and reading the Dwell of the right points.

Limits within which reading should be are shown in the table below.

Model	20 M P H DWELL			80 M P H DWELL		Breaker Spring Tension
	Adjust left point to:—	Adjust combined points to:—	Right point should then be	Individual points	Combined points	
V-8, 68 & 78	50	80	45-55	48-50	78-80	20-24
Earlier V-8s	60	80	55-65	48-60	68-80	22-27
Lincoln Zephyr	At 20 M P H, adjust each point to 60		80 M P H Dwell of each point should be 58-60			20-24

2. ADJUST % DWELL ON LINCOLN-ZEPHYR.

(Refer to Pages 56 & 57 for description of Lincoln-Zephyr distributor and wiring diagram.)

Install distributor on Stroboscope fixture.

Remove Vacuum Brake.

Clip Black Interrupter and Black Low Tension together.

TURN % DWELL RHEOSTAT CLOCK-WISE UNTIL IT STOPS.

Do not insulate the points. This is not necessary because each pair is in a separate circuit on the Lincoln-Zephyr.

Plug Meter Jack into MPH. Set speed at 20 MPH. Leave running.

Change Meter Jack to top of Plug in % Dwell Socket.

Ground Red Low Tension to distributor case. Adjust % Dwell reading so obtained to 100 on Scale B.

CHANGE RED LOW TENSION TO "HOT" END OF LEFT CONDENSER. (See Figure at right which shows this connection.)

Adjust Dwell of left points to 60.

* * *

Change Red Low Tension to "hot" end of **RIGHT** Condenser.

Adjust % Dwell of Right points to 60.

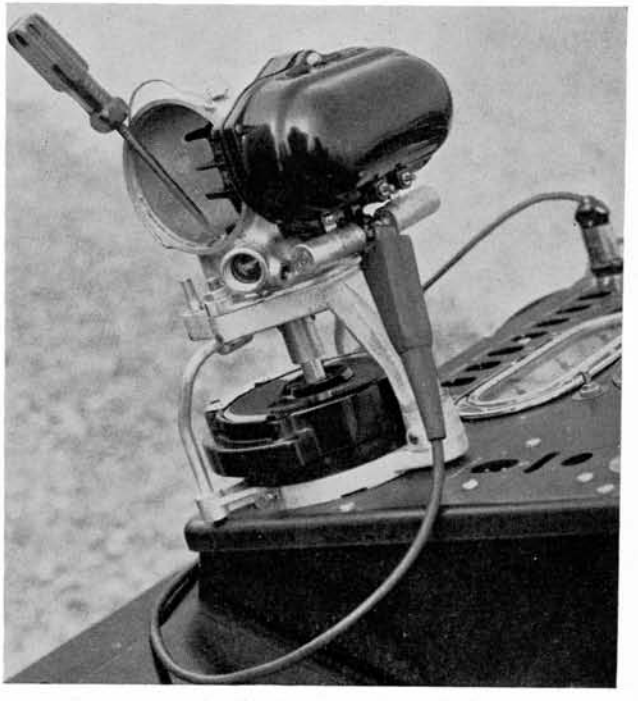


Fig. 5

3. TEST % DWELL AT HIGH SPEED. (V-8 & L-Z)

Note:—These tests should be carried out immediately following the adjustment of the breaker-points, Tests 1 & 2.

Reference to the Table at the foot of Page 77 will give correct % Dwell readings for 80 MPH.

* * * * * * * * *

After adjustment of the points of either V-8 or L-Z distributors, place Meter Jack in MPH Socket and speed up to 80 MPH.

Replace Meter Jack on Plug in % Dwell Socket and take % Dwell reading on Scale B.

If points were correctly set at 20 MPH yet the results at 80 MPH are low or unsteady, the breaker-point springs may be at fault or a breaker-arm may be tight on its pivot.

4. TEST RESISTANCE AND CONTINUITY OF PRIMARY CIRCUIT. (V-8 & L-Z)

Up to this point, no current has been put through the primary of the Coil. Prior to the High Tension Tests it is as well to check the Primary circuit for correct resistance.

With the Stroboscope at rest and the points on contact, obtain a 100 reading on the % Dwell Scale with the Red Low Tension grounded to the distributor case.

Transfer the Red Low Tension to the Coil terminal. (Test individual coils on the Lincoln-Zephyr.)

If no reading is obtained with points on contact, the primary circuit of the coil is broken.

Readings will vary with those given on Pages 21 and 58 because the Resistor unit is out of the circuit.

Readings should be within a couple of points each way of **80** for all coils—Ford and Lincoln-Zephyr.

5. SET TIMING OF DISTRIBUTOR AND CHECK SPARK ADVANCE. (V-8 & L-Z)

The Stroboscope is provided with two special distributor caps; one for the V-8 and one for the Lincoln-Zephyr.
Before proceeding with this test, make sure that the two long lines on the front of the Stroboscope base are opposite each other. (Fig. 1. insert.)

V-8 Timing.

Timing will be carried out by observing the flashes of light through the two small holes in the disc (Fig. 1. H) and checking and adjusting their location with the aid of the movable Peep-sight, P.

Install special distributor cap and plug into the Stroboscope base.

See that the setting of the disc is 45°.

Connect Red Low Tension to the Coil terminal.

Plug into MPH and set speed at 7 MPH.

Observe flashes of light through the holes H. (Fig. 1.) Move the Peep-sight into line with them and note the reading on the Scale.

At 7 MPH, the flashes should be opposite Zero on the Scale.

Move Timing Adjusting Screw on distributor case until this reading is obtained.

When correct adjustment is obtained, tighten Adjusting Screw. Left side of Figure 6 shows operation at this point. When the screw is tight, re-test to make sure that tightening did not move the adjustment.

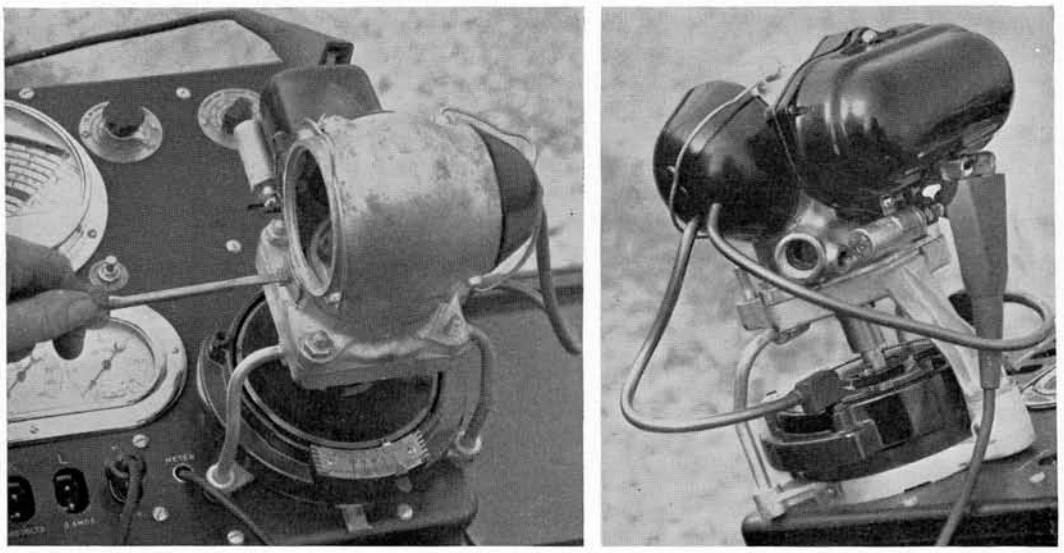


Fig. 6

Lincoln-Zephyr Timing.

Set disc at 37½°.

Install special distributor cap and plug both leads into Stroboscope base.

Plug Meter Jack into MPH and set speed at 7 MPH.

Clip Red Low Tension to BOTH coils—see right side of Figure 6 which shows this connection.

Time exactly as for V-8 using Peep-sight and Timing Adjusting Screw.

The one exception is that, prior to this test, the Timing Adjusting Screw should be taken out and its plate removed and the Screw replaced to give the operator something with which to move the adjustment. When a correct setting has been obtained, it should be left "open" for the Synchronizing operation—Page 82.

The basic timing of the Lincoln-Zephyr distributor is carried out with the left points—left on the car. Therefore, if the operator prefers to do so, he can make this adjustment with the Red Low Tension clipped to the left coil only. Ford and Lincoln-Zephyr distributors are set with an initial spark advance of 4° before Top Dead Center of the crankshaft or, 2° of the camshaft. The long marks on the Stroboscope base, when opposite each other, represent the 2° advance of the camshaft. Thus, a Zero reading at the Peep-sight is actually the 2° camshaft advance, or, 4° of the crankshaft.

* * * * * * * *

Check Spark Advance, V-8 & Lincoln-Zephyr.

This operation consists of speeding up the Stroboscope and observing the Spark Advance on the Scale.

As the speed is increased from 8 MPH, the flashes seen through the holes in the disc will move to the left by the action of the governors in the distributor.

These flashes should be followed with the Peep-sight and the number of degrees of the maximum advance noted. At the same time, by plugging into MPH, the speed at which maximum advance occurs can be checked.

The table below gives the correct degrees of advance for all V-8 and Lincoln-Zephyr distributors, as well as the speeds at which they should be reached.

Model	Speed	Degrees advance
18	34	7½-8½
40-A	60	10½-11½
40-B	60	7½-8½
68—78—L-Z	38	7½-8½

6. SYNCHRONIZE LINCOLN-ZEPHYR DISTRIBUTOR.

Set disc at 37½°.

As explained on Page 59 under "Timing the Lincoln-Zephyr Distributor," the right points can be moved on the breaker-plate and the angle they make with the left points can thus be changed. This provides accurate adjustment between the two ignitions so that the sparks occur on either bank of cylinders at exactly the same relative piston positions.

The stroboscopic image obtained with the output of both Lincoln-Zephyr coils wired to the disc is illustrated in Fig. 7. The bars represent the red flashes which show through the disc while it is in motion.

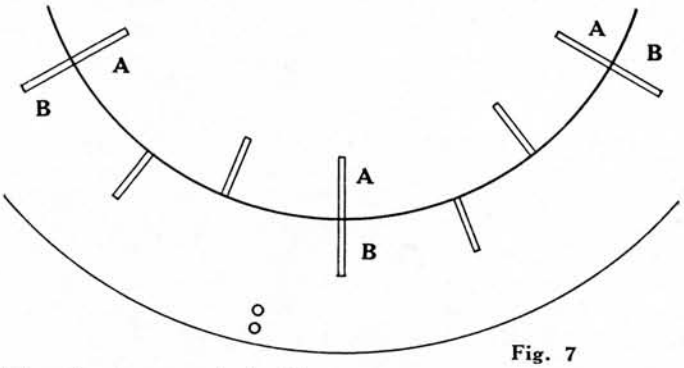


Fig. 7

The bars A are 60° apart. The Bs are also 60°. The As and Bs are the only ones to which attention should be paid. Ignore the other bars.

The flashes at A & B appear opposite each other when synchronism is correct. Adjustment to bring about this alignment is shown at S, Fig. 8. Moving the screw S—which is actually a cam—should be done with great care so that the basic Timing remains unchanged.

Having completed the adjustment, the Timing Adjustment Screw, T, and its Plate should be replaced and a final test made after tightening to see that no movement has taken place.

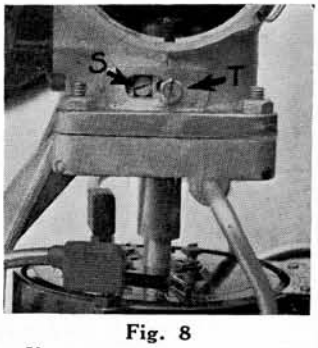


Fig. 8

Note:—An error the width of a bar of light on the disc represents 1°. For this reason, the greatest care should be exercised in timing and synchronizing.

* * * * * * * *

7. OBSERVE STROBOSCOPIC IMAGE.

This operation is carried out to be sure that the distributor shaft is not bent and that the cam and spring action are as they should be.

Wire up as for **Timing** with the High Tension plugged into the Stroboscope Base (See Figure 6).

Run the Stroboscope at varying speeds and note the image on the disc.

If it is noticed that the flashes are irregular and not always opposite each other in spite of efforts to adjust, it is safe to say that there is a **mechanical** defect in the distributor. It is assumed, of course, that the points have been correctly set and are in good condition. Also the coil and condenser should be normal for this test.

8. CHECK COIL OUTPUT AT 20 MPH.

Reference should be made to Page 39 which describes this test without the Stroboscope using the Interrupter on the Test Set. Seeing that the coil is now mounted on its own distributor, it may now be tested on the Stroboscope under actual working conditions.

The test is essentially the same as that on Page 39.

Connect Black Interrupter to coil terminal.

Make sure points are on contact and allow coil to heat up for 5 minutes.

Note:—On the Lincoln-Zephyr distributor, both coils can be heated at once by finding the place at which both points are on contact. (See Explanation on Page 57.)

Set Sparkmeter Selector Switch at 120.

Connect Red Sparkmeter lead to High Tension from Special distributor cap—see circle on Fig. 9.

Run Stroboscope at 20 MPH.

Plug Meter Jack into Milliamps.

(Figure 9 shows test at this point.)

Spark should be regular in Spark Gap and reading on Meter should be over ½ Milliampere.

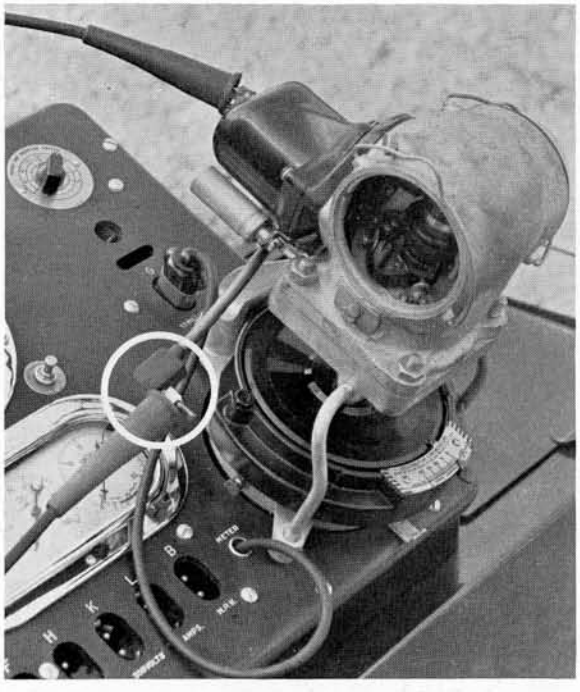


Fig. 9

9. CHECK COIL OUTPUT AT HIGH SPEED.

Set Selector Switch at 60. Speed up until ignition starts cutting out and Meter reading starts dropping into the ½ Milliamp red patch on Scale G.

Change Meter Jack to MPH and see whether speed at which coil is cutting out is in excess of the maximum speed of the car.

Note:—On the Lincoln-Zephyr, check each coil separately.

10. ADJUST VACUUM BRAKE—V-8 AND LINCOLN-ZEPHYR.

Up to this point, the Vacuum Brake has been out. Replace it and back off the Adjusting Screw.

Re-connect Black Interrupter and Black Low Tension.

Connect Red Low Tension to Coil terminal.

Set Peep-sight pointer at Degrees specified in the table.

Model	Degrees	Speed MPH
18—40-A—40-B	0	17
L-Z—68—78	2	38

Connect Coil output to Stroboscope base with special Cap.

Start up Stroboscope and adjust to speed specified above.

Spark advance will take place owing to loosening of Vacuum Brake Adjusting Screw.

With one hand, screw in the brake adjustment and, with the other hand, maintain the specified speed against the drag of the brake.

When the brake holds the flashes opposite the Peep-sight at the specified speed, it is correctly adjusted.

The brilliance of the flashes from the neon tube can be controlled by the % Dwell Rheostat.

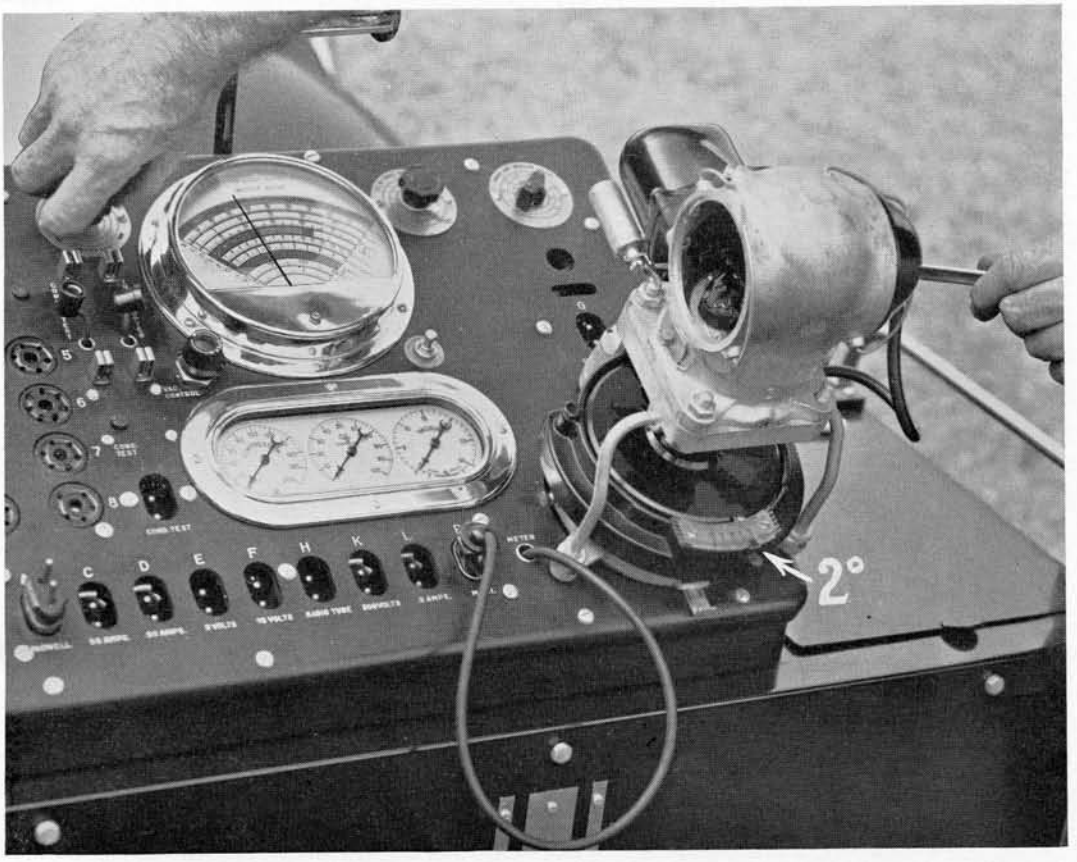


Fig. 10

Note:—The Red Low Tension has been passed around the back of the Set and the connection to the coil terminal is not seen in the Figure.