SERVICE BULLETIN No. 16-39

ALIGNING NEW BREAKER POINTS

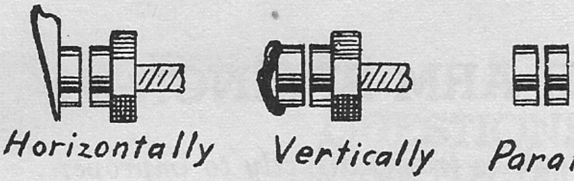


FIG. 1

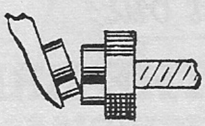


FIG. 2

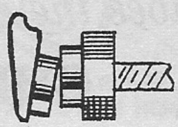


FIG. 3

Mechanics are often surprised to find that new breaker points do not line up perfectly in the distributor when first installed. The prevailing idea is that new points should be manufactured with accuracy and precision and should therefore fit "as is".

This idea is absolutely correct so far as the manufacture of points is concerned. Generally speaking, they *are* made correctly. Besides which, "Blue Streak" and "Standard" points are carefully checked on actual distributor breaker plates. But, as considerable variations are found between individual new breaker plates of the same type, a standard is set up from an average plate to which standard our points are made and rigidly checked.

So far, we have been talking about brand new breaker plates. When it comes to plates that have been in service on the car, the discrepancies and variations are much more numerous as the plates often warp or change dimensionally to some extent. It takes but a very small change to throw points out of alignment, especially on the Autolite system that uses a screw type stationary contact. In this case the movable arm travels in an arc, with the bushing as the center, while the screw is adjusted in a straight line. Therefore, the relation between the two contact surfaces is not a fixed one, but changes with adjustment. With a .020" gap on a perfect breaker plate, the points should close with a correct horizontal, vertical and parallel with each other line-up, as in FIG. 1. If the gap is only .002" off, the relation between the tungsten surfaces will change and throw them out of alignment. If the gap is larger, that is, when the screw is moved further away from the arm, the result will be as in FIG. 2. If the gap is smaller, that is, the screw is closer to the arm, the points will look like FIG. 3.

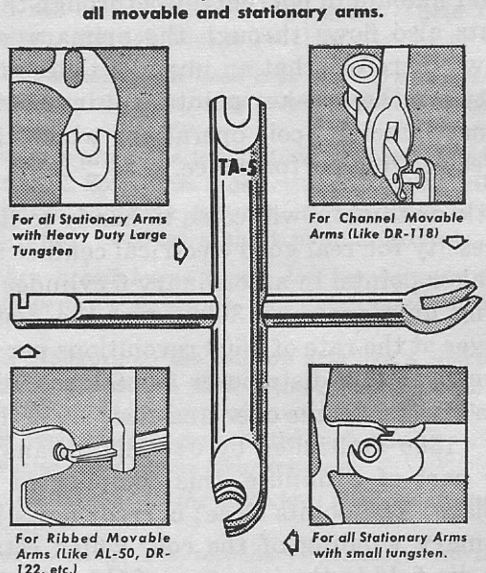
In both cases, the alignment will be thrown out horizontally as well as out of parallel .You must remember that .002" is a real small error when a feeler gauge is used with the distributor on the car and the mechanic working in a cramped position necessitated by modern car construction where a distributor is often inaccessibly placed. All of the above applies to Autolite distributors. The Delco-Remy distributors are easier to adjust, as both breaker points move in the same arc, so that their relation remains practically constant. regardless of gap.

In all types, however, a warpage of the breaker plate will throw the points out of alignment, as any change in the breaker plate will affect the contact screw support as well as the stud that serves as a bearing for the movable arm. Any change of position in either of the two parts will also change the position of the breaker points in relation to each other and break up the perfect alignment.

What's the answer then? One manufacturer of original equipment says:

> "Distributor contact points must be correctly aligned for satisfactory performance."

The BLUE STREAK TA-5 Adjusting Tool can be used to align all movable and stationary arms.



In the installing of points it must also be considered that, like all manufactured products, a certain amount of tolerance must be allowed in the making. A bakelite rubbing block, for instance, can vary up to about .003"; a tungsten contact disc can also vary that much in thickness. Sometimes these two tolerances are both on the high side, so that the total variation is .006". Any mechanic who works on cars knows that such tolerances are not excessive and are perfectly legitimate in any assembly.

The conclusion to be drawn from this discussion is that the most accurately made points cannot be expected to fit perfectly unless they are correctly adjusted to the individual distributor on which they are installed. This is a rule that must be followed in every case where new points are installed if good car performance is desired.

SERVICE BULLETIN No. 62-50

do the points burn out?
does the coil cut out?

CHECK THE BREAKER ARM SPRING!

Many irregularities in ignition performance can be traced directly to improper tension of the breaker arm springs, the importance of which is often overlooked when breaker point installations are made. In this bulletin, we will try to show you the hows and whys of this important part of the ignition system.

While varying in shape with the different types of breaker arms, the function of the breaker arm springs is identical in all applications: to provide a good electrical contact between the breaker points. The primary winding of the ignition coil is connected in series with the breaker points, which means that whatever amount of current flows through the breaker points also flows through the primary winding. It follows therefore that an imperfect electrical contact between the breaker points will invariably produce unsatisfactory coil operation, which, in turn, will affect engine performance.

A little arithmetic will come in handy to illustrate the necessity for real good electrical contact between the breaker points. In an ordinary 6 cylinder engine, operating at a speed of 3000 rpm, the distributor turns over at the rate of 1500 revolutions per minute. As the cam in this distributor has 6 lobes, it follows that the breaker points open and close 9,000 times per minute (1500 multiplied by 6). This means that in 1/9000 part of a minute, this complicated process takes place: The points close; current flows through the primary winding of the coil, which establishes a magnetic field in the iron core of the coil as well as in the high tension winding; the points open and the current through the coil winding is interrupted, causing the coil to deliver a voltage of about 10,000 volts which is required in order to fire the spark plug gap, (see bulletin 39-42).

All of this has to happen 9,000 times each minute you drive your automobile at a moderate rate of speed! (In an 8 cylinder car, at 3,000 rpm, this would happen 12,000 times each minute). As the breaker arm spring is the part that is solely instrumental in bringing the breaker points firmly together for each one of the 9,000-per-minute perfect electrical contacts, you can readily see how important it is that the spring tension is correct for the task. If the tension is too weak, the electrical contact between the points will be imperfect and the entire ignition system will be thrown out of mesh.

You might say that if this is the case, why not make the springs real strong, so that a solid electrical contact will always be assured. The trouble is that an excessive spring tension would cause rapid wear of the bakelite bumper block, which would reduce the gap between the points and bring in point burning and other ignition irregularities.

The inevitable conclusion is that the spring tension must be right for best ignition performance: neither too weak nor too strong.

What *is* the correct spring tension? This depends upon the type of distributor in which the breaker arms are used, and you will find the specifications at the end of this bulletin. You will notice that all the specifications show a permissible variation of four ounces, or plus and minus two ounces. The springs on our "Standard" and "Blue Streak" breaker arms are individually calibrated to a correct plus or minus two ounce tension, but it must be understood that even this degree of manufacturing precision will not always assure you of the correct spring tension when the breaker arm is installed on a distributor. This is due to the fact that when the same arm is installed on different types of distributors the resulting tension will not always be the same. That is why on a number of Delco-Remy distributors, the breaker arm spring is fastened to a bakelite plate on the stationary arm, (our DR-136 and DR-137) and the bakelite plate has a slotted hole for the fastening screw and nut. By shifting the fastening screw forward in the slot, the tension of the spring is increased and by shifting it backward, the tension is decreased. On other types of distributors, no such adjustment is possible, because the spring is fastened to a stationary stud.

In most Auto-Lite distributors, a breaker arm is used which has a slotted hole in the spring (our AL-50) used for the purpose of adjusting the tension for the particular distributor. On other distributors, such an adjustment does not exist.

The gist of the above is that each installation of breaker points should be considered as an individually tailored job, so far as spring tension is concerned. The mechanic should use a spring tension gauge and adjust the spring tension according to specifications. The method of adjustment is the same for all types of breaker arm springs and the Delco-Remy manual describes it as follows:

> *"The pressure can be adjusted by bending the breaker lever spring. If the pressure is excessive, it can be decreased by pinching the spring carefully. To increase, the lever must be removed from the distributor so the spring can be bent away from the lever. New breaker lever springs may be stronger than required in service; be sure to check the spring tension of all new levers when installing."*

The Auto-Lite manual recommends the following procedure:

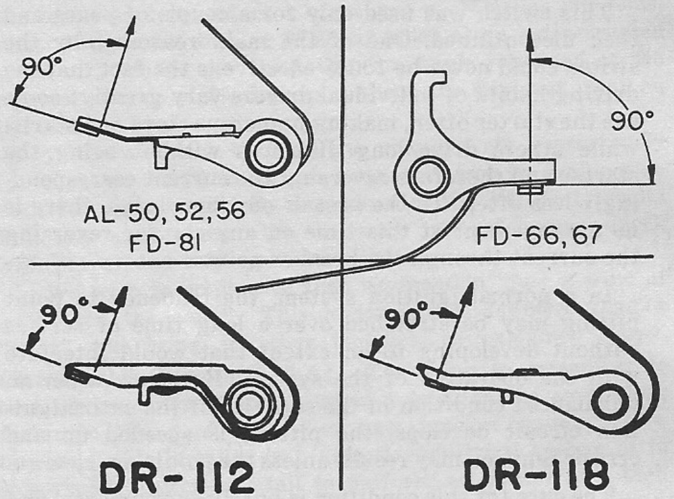
> *"Adjust to the correct tension by loosening the screw holding the end of the contact spring and sliding the spring in or out as necessary. On distributors having the breaker arm spring fastened by the terminal post, install washers between the spring and base insulation to change the spring tension. Retighten the screw or terminal and re-check the tension. This tension should be within limits, as too low a pressure will cause missing at high speeds and too high a pressure will cause excessive wear of the cam and rubbing block."*

In other words, regardless of system or manufacture, the checking and adjusting of breaker arm springs is a *must* whenever points are installed, and any shortcuts may lead to trouble. Note that the Delco-Remy instructions quoted above warn you that the spring tension of their new arms is stronger than required and that adjustment must be made. On our arms, the spring tension is correct when the arm is manufactured, and while it must still be checked due to the different types of distributors, in most cases it will not be necessary to bend the spring.

Whenever a stainless steel type of spring is encountered, special precautions should be taken. Due to the nature of the material, it may change its shape and tension if not carefully handled. It is especially important that the stainless steel springs be handled gently during installation and be checked for correct spring tension after they are installed. Following are the tension specifications for the various types of breaker arms:

AL-50	**17-21 oz.**	**DR-118**	**17-21 oz.**
AL-52	**17-21 oz.**	**FD-66**	**22-27 oz.**
AL-56	**17-21 oz.**	**FD-67**	**20-24 oz.**
DR-112	**19-23 oz.**	**FD-81**	**17-21 oz.**

The correct method of checking spring tension of the various types of breaker arms is illustrated below:



The illustrations show where the hook of the tension gauge is to be applied and the direction of the pull.

Only by following these instructions can you be sure that troubles like the burning of points and missing at high speeds, are not due to incorrect tension of the breaker arm spring.

SERVICE BULLETIN No. 65-51

PITTING OF DISTRIBUTOR BREAKER POINTS

Distributor breaker points even in normal operation are subject to pitting, that is to transfer metal from one contact to the other, leaving a cavity or pit in the point from which the metal was transferred and developing a projection or tip on the point to which the metal was transferred. While this process is comparatively slow in a normal car system, as only a very small amount of metal may be transferred at each make-and-break of the contacts, eventually, in long service, sufficient metal may be transferred to interfere with the efficient operation of the Ignition system, and the contacts would have to be cleaned.

In 1941, an attempt was made on the Chevrolet car to minimize the tendency to pitting. A reversing switch was incorporated in the distributor circuit which automatically reversed the direction of the current through the points each time the starter pedal was used. The idea of the reversing switch was based on the theory that current flowing from one contact to another caused the transfer of metal and that by reversing the polarity or the direction of the current periodically, the direction of the transfer of metal would also be reversed at the same time, thus neutralizing itself and leaving the breaker points free of pits.

This switch was used only for a couple of years and then discontinued. One of the main reasons why the switch could never be 100% effective is the fact that the driving habits of individual drivers vary greatly: some use the starter often, making numerous stops and starts, while others drive long distances without using the starter and therefore reversing the current correspondingly less often. To the best of our knowledge, there is no arrangement at this time on any car for reversing the current through the breaker points.

In a normal ignition system, the tendency to point pitting may be stretched over a long time of service without developing to an extent that would interfere with the operation of the system. However, when an unbalanced condition in the capacity of the entire ignition circuit develops, the pitting is speeded up and erratic ignition may result, unless the points are cleaned.

The cure for this condition is purely experimental and varies with the individual car, as several causes may contribute to the trouble and it may be necessary to remove one or more of them to eliminate it. Also, the type of operation the particular car is used in may determine the extent of pitting, if any, and require a change in the curing process. Continuous fast driving, for instance, requires a condenser of low capacity while the same car driven continuously at low speed with much idling would require a higher capacity condenser.

TO CURE THE TROUBLE:

First determine just how the transfer of metal takes place: is it transferred from the positive contact to the negative contact, or vice versa? If the metal transfers from the negative to the positive contact, that is if a tip appears on the positive contact...

increase condenser capacity;

or shorten the condenser lead, if possible;

or re-arrange the low-tension lead from the coil to the distributor and the high-tension lead from the coil to the distributor so that they are further away from each other;

or bring both of these leads closer to a ground, which may be any part of the engine block or the car frame.

If, on the other hand, the metal is transferred from the positive contact to the negative, that is if a tip appears on the negative contact...

reduce the capacity of the condenser;

or lengthen the condenser lead;

or re-arrange the low-tension lead from the coil to the distributor and the high-tension lead from the coil to the distributor so as to bring them closer together;

or move both of these leads further away from the nearest ground.

As we said before, these corrective steps are purely experimental, as one or more may be necessary to remedy or alleviate the condition. By the same token, it is also a matter of experiment as to how far or near the leads should be moved, etc., as each case of such trouble varies with the individual car in which it occurs.

SERVICE BULLETIN No. 46-46

THAT LITTLE BUMPER BLOCK

Reports have been coming in of ignition failures due to the rapid wearing of the bakelite bumper block on breaker arms. Careful investigation shows that this complaint is not limited to any particular make of breaker arm but is general in scope. From a number of worn specimens and from experiments performed in our laboratory, we have been able to determine the cause as well as the cure for the failures.

First of all, it will probably be of interest to the trade to learn the construction of the simple looking bumper block. It is made of numerous layers of tough canvas sheets which are impregnated with bakelite resin. The canvas is arranged so that the ends of the canvas threads are perpendicular to the rubbing surface of the bumper block, similar to the grain structure of a butcher's chopping block. This construction results in high wear resistance.

The bakelite impregnated canvas in lengths of 12" to 24" is put into molds and then subjected to heat and pressure. The result is a long stick of material which has the general shape of a multitude of bumper blocks joined side to side. The stick is then put through a number of milling operations which provide the close tolerances required in the dimensions of the bumper block. The stick is finally cut up into individual bumper blocks.

Speaking of tolerances, the important dimensions of the bumper block that directly affect ignition performance are very closely held. Some tolerances run as low as plus or minus .0015, which is quite a tight tolerance for a commercial product like a breaker arm.

From all of this information, you can see that the simplicity of the bumper block is limited to its appearance and that there are many features in the block that are not apparent to the casual observer.

After the bumper block is manufactured, checked and attached to the breaker arm, it is fully capable of doing its work for thousands of miles, provided it is given a chance. However, we have come across breaker arms where the bumper block was worn down in 100 miles of operation to an extent that the breaker point gap would change efficiency to interfere with good ignition performance.

In our Blue Streak Service Bulletin No. 42-40B we call attention to the distributor breaker cam and explain that a rough spot on the cam will chew up a bumper block in no time. When we say "chew up" we mean just exactly that—a rough cam will make the bumper block look as if it had been handled by a buzz-saw, with shreds of canvas and bakelite chewed off the rubbing surface.

To get away from theory and get right down to cold facts, we performed the following experiments in our laboratory:

(1) We took a distributor off a 1940 car and set it into a Distribu-scope. Without making any other changes, we installed a set of new breaker points into this distributor, adjusted the cam angle to exactly 35 degrees and ran the distributor at a speed corresponding to 35 miles per hour car speed.

After a run corresponding to only 50 miles of service on the car, the cam angle changed from the original 35 degrees to 42 degrees, showing that the rubbing block had worn down sufficiently to reduce the gap between the points. In service this would produce point burning, erratic coil action and generally unsatisfactory performance.

We removed the breaker arm from the distributor and examined it thoroughly. We found that the bumper block had made contact with the cam just on one corner of the block because there was a rust spot on the cam. The bumper block was damaged by the rust on the cam at the point of contact.

(2) A new distributor was then set up with new breaker points and adjusted to a 35 degree cam angle. **The distributor cam was not lubricated.** The distributor was run at a speed corresponding to a car speed of 60 miles per hour. After a 500 mile run the cam angle changed to 40 degrees, which was sufficient to develop trouble in service.

(3) Using the same distributor as in test (2) with a new breaker arm and with a wipe of grease on the cam, the test was repeated at a car speed of 75 miles per hour. After 50 hours of test, or 3750 car miles at an uninterrupted speed of 75 miles per hour, the cam angle remained at the original setting of 35 degrees without the slightest wear on the bumper block.

While we know that no one drives a car continuously for 50 hours at 75 miles per hour, this test in conjunction with the other tests fully demonstrates the different results that can be obtained with the same type of bumper block with proper and improper operation.

We wish to emphasize that we mention "just a wipe of grease on the cam." This is important, as more than a "wipe" will bring in other troubles, as explained below. (See Service Bulletin 5-37-A). The thing to remember is that the condition of the distributor is often the controlling factor in the performance of new breaker points. New breaker points installed in a defective electrical system or in a worn distributor will fail to perform no matter how high their quality is or how precisely they are manufactured. A worn or rusty cam will injure the bumper block; lack of cam lubrication will wear it down; too much cam lubrication will throw the grease upon the surface of the tungsten contact and interfere with operation.

To install new points is not enough—the installation must be right.

SERVICE BULLETIN No. 54-48

BURNED POINTS AND BREATHER PIPES

It often happens, especially in dusty locations, that the crankcase breather pipe in the car becomes clogged. Oil fumes leave a sticky deposit on the mesh of the breather pipe, dust adheres to the deposit and eventually the pipe is completely clogged.

When that takes place, crankcase fumes are pumped into the distributor and deposit a film on the tungsten contacts of the breaker points. This film forms an insulating agent on the tungsten surfaces, causing hard starting or even complete failure to start. Often, the film burns up under the action of the spark between the points and forms a bluish-black caked deposit which is mistaken for condenser trouble or a high voltage condition.

It is understandable that a mechanic working on the ignition system of a car will pay little or no attention to the oil filler tube in the cap which the crankcase ventilator is installed. To be safe, however, we recommend that this possible source of trouble be investigated whenever ignition work is done.

STAINLESS STEEL SPRINGS ON BLUE STREAK BREAKER ARMS

There are many automotive distributors in which breaker arm springs break frequently.

The trouble is caused mainly by the presence of corrosive fumes and vapors in the distributor. Sulphuric acid fumes, liberated by crankcase oil, get by the distributor shaft, especially if the bushings are worn, and corrosively attack all metal parts of the distributor. The breaker arm spring is especially vulnerable to the corrosion, as it is constantly being flexed under tension and as soon as corrosion makes any headway, the spring breaks at its bend, where the flexing takes place.

Another cause of trouble is the high tension sparks which normally jump between the rotor segment and the distributor head inserts during operation. These sparks produce oxides of nitrogen which combine with atmospheric moisture to form a corrosive vapor that attacks the metallic parts of the distributor, including the breaker arm spring.

While distributor heads are usually provided with ventilating holes that tend to clear out the various corrosive fumes to some extent, there are applications like the Ferguson Ford Tractor, for instance, that operate in dusty locations. In such cases, dust, dirt and grease clog the ventilation holes so that the corrosive fumes remain within the distributor with resulting breakage of breaker arm springs.

Of course, we have no control over the above situation, but to offset them we are now furnishing all our Blue Streak arms with STAINLESS STEEL springs, which resist the corrosive action of fumes and vapors in the distributor and will not snap like the ordinary steel springs.

So, whenever you find a broken breaker arm spring in a distributor, a Blue Streak arm with its stainless steel spring will eliminate the trouble.

SERVICE BULLETIN No. 59-49

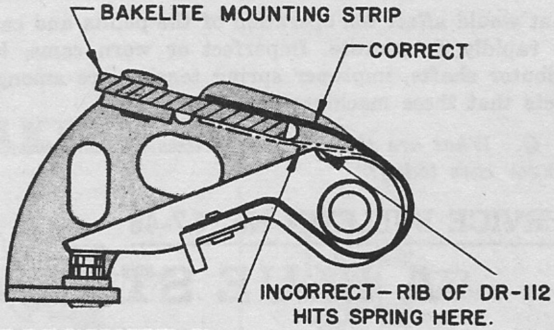
PROPER INSTALLATION OF DR-1236 TYPE BREAKER POINTS

It has been called to our attention that trouble is sometimes experienced in the installation of Delco-Remy type point sets, our No. DR-1236 and DR-1236X.

It is claimed that when the points are installed, the DR-112 breaker arm rib hits its tension spring and some mechanics have had to file down the rib of the arm. *This happens only when the points are improperly installed.*

In this point set, the tension spring of the movable arm has to be fastened to a bakelite strip mounted on the stationary arm. *The proper method of installation calls for placing the tension spring on the* outside *of the bakelite strip. Trouble arises only when an attempt is made to place the spring on the* inside *of the bakelite strip.*

Even if the installation difficulty did not exist, wrongly placing the spring on the inside of the bakelite strip would still result in improper operation of the distributor. In order to fasten the spring inside the bakelite strip, it must be bent down further than if correctly placed. When that is done, the spring tension is thereby increased beyond the proper limit, and the bumper block wears too rapidly, cutting down the point gap. This will result in rough engine operation and in burning of the points.



SERVICE BULLETIN No. 2-37

QUESTIONS AND ANSWERS
ON THE ELECTRICAL SYSTEM OF THE CAR

Our aim in issuing these service bulletins is to help the repairman cope with some of the technical difficulties he encounters in his everyday work.

Over a period of many years we have answered many questions on the electrical system of the car. After tabulating these questions we found that about twenty of them are most frequently asked by repairmen, and it is these questions that we have selected as the subject for this month's service bulletin.

Q. *Can a condenser leak and still run the car?*

A. Yes, if the leakage is not excessive. It will, however, impair the efficiency of the system.

Q. *What is the trouble in a condenser that so often fools the mechanic?*

A. A high resistance connection, i.e., an internal connection in the condenser that is not electrically perfect.

Q. *What is the voltage surge that the condenser gets when in the circuit?*

A. About 350 volts.

Q. *What is the purpose of the holes on the sides of the distributor head?*

A. For air ventilation. On damp days there is a tendency for moisture to collect inside the distributor head, causing high tension shorts. The holes allow the air to circulate through the head, and draw off the moisture.

Q. *Can you substitute generator brushes of the same size?*

A. No. The brushes used on a generator must have the proper degree of hardness according to the composition and speed of the commutator of that particular generator.

Q. *Is it best to use a soft brush or a hard one?*

A. Depends upon the commutator and speed.

Q. *What gives the most trouble on a coil?*

A. Breakdown of insulation in the high tension winding.

Q. *What effect has the radio on the original equipment coil?*

A. The coil efficiency is affected enough to cause hard starting, etc. By introducing resistance in the form of suppressors into the high tension circuit, the spark is weakened. When a radio is used on a car, a higher power coil is required.

Q. *What happens when Ford coils are put on larger cars?*

A. The coils for Ford (Model A) are designed to operate on a 4 cylinder motor, and to deliver a sufficient number of sparks per minute for this purpose. To use this coil on other cars is like putting a passenger car sized tire on a truck—it will break down in a short time.

Q. *Why are some points ground oval, and others flat?*

A. The oval or crowned points are supposed to be self centering against the flat surface of the other points.

Q. *What causes the resistance in the battery?*

A. Sulphation and hardening of plates, due to shortage of water.

Q. *Can you test points with a voltmeter?*

A. Yes. With the ignition on, motor still and points closed,—a low reading voltmeter connected across the points should show not more than ½ volt. A higher reading indicates imperfect contact due to dirt, oxide or bad burns. There are also voltmeter tests across the points with motor running, when the reading should be 2½ to 3 volts at idling speeds and not over 5 volts at high speed. These running tests, however, are not always reliable.

Q. *When a distributor head arcs and burns across inside from segment to segment, was this caused by a defective head?*

A. No. It is often due to moisture or sweating inside the distributor head. Sometimes a defective spark plug will cause sparking to the adjoining segment, if it happens to be near the clamp, which provides a short path to ground.

Q. *When a coil burns across the top between the secondary and primary terminals, was this caused by a defective coil?*

A. No. Moisture on the coil top acts like a short circuit between the high tension and primary posts. Burnt down rotor segment or widely set or burnt spark plug electrodes act as high resistances and cause the high tension current to take the easier path to the primary post.

Q. *Do more turns on the secondary winding always mean a better coil?*

A. Not in itself. The secondary, primary, and the core must be completely balanced.

Q. *Why do so many condensers test defective on the Neon tube type of tester and yet will test O.K. on the meter type of testers?*

A. The Neon tube is too sensitive for this purpose as it will register not only condenser leakage but any leakage in the tester itself due to moisture on terminals or wires of the tester.

Q. *Is there any advantage in setting points (not dual) on machines such as Weidenhoff's oscillographs, syncrographs or stroboscopes, instead of using a thickness gauge?*

A. Indirectly the advantage lies in the fact that in order to do so the distributors must be removed from the motor and usually gets a cleaning. Otherwise distributors are allowed to operate in a greasy and dirty condition which materially affects its efficiency. The direct benefits are due to the fact that these machines will show up defects in the distributor

that would affect the operation of the points and cause them to rapidly deteriorate. Imperfect or worn cams, loose distributor shafts, improper spring tension are among the defects that these machines show up.

Q. ***What are the usual capacities of condensers on passenger cars today?***

A. About .24 microfarads.

Q. ***Why do we not favor bakelite case coils?***

A. All coils develop heat with a proportional loss of efficiency. Bakelite, being a poor conductor of heat, prevents the dissipation of the heat, as it confines the heat within the windings.

SERVICE BULLETIN No. 57-48

A BLUE STREAK HEADLIGHT RELAY TO THE RESCUE

There are many hidden sources of trouble in the electrical system of the car that are seldom corrected or even suspected. One of these trouble sources lies in the ignition switch.

In the good old days, when the electrical system of the car was comparatively simple, an ignition switch was used just as its name implies, for turning the ignition off and on. Now, however, it seems that control of ignition is only *one* of the functions of this switch, the other functions being the control of numerous electrical operating units and accessories.

Let us take a late model Dodge, for instance. Here the ignition switch controls the starter relay, the backing light, the electrical windshield wiper, the hand brake signal, the directional signals, and various gauges; and sometimes also the radio, heater and defroster. And, as an afterthought perhaps, the ignition switch actually controls the ignition.

All of this means that often the ignition switch carries a great load, and we all know that switches of any type do get out of order. Even if you had an individual switch for each one of the above accessories, you would have to replace it occasionally. When all the accessories are connected to *one* switch, the effect is cumulative and the switch is bound to deteriorate or get out of order. The sad part of it lies in the fact that any defect in the switch affects the most important unit it controls: the ignition coil.

Many good coils have been unnecessarily condemned and replaced by new coils due to an overworked ignition switch. But what is still sadder is that the replacing of the coil does not cure the trouble in the switch, which must also be replaced eventually.

Is there a remedy for this bad situation? Yes, a very simple one, and one that is becoming more and more popular. The answer is a *single headlight relay and a simple change in wiring*. While we furnish herewith a typical diagram of connections, the change can be described in a few words. Just disconnect the leads of all accessories from the ignition switch terminal and connect them to the "L" terminal of the headlight relay. Now run a #16 or #18 wire from the vacated terminal of the ignition switch to the "S" terminal of the headlight relay. Finally, run a #10 gauge wire from the live, battery side of the ignition switch to the "B" terminal of the relay, and you're all set. Of course, the lead from the ignition coil remains on the ignition switch.

The picture is now completely changed. Whereas before the ignition switch handled many amperes, it now handles just about one-third of an ampere in addition to the coil current, and this it is fully capable of doing without developing trouble. Thus, while the ignition switch still controls the various accessories as before, the addition of the headlight relay makes the ignition switch become once more an actual ignition switch and not a general utility switch. And, if you recommend to your customers the installation of headlight relays for this purpose, you will open up a new source of profitable business and save them probable headaches in the all-important ignition circuit. Makes sense, doesn't it?