

Next best to getting a new car is to inject new life in the old one. The right kind of servicing does just that.

How an

Expert Does a Tune-up

By **R. P. Stevenson**

PS photos by Hubert Luckett

WHAT is an engine tune-up, anyhow? Like the blue-plate special, a lot depends on where you buy it. Different manufacturers specify different procedures, and further variations are introduced from shop to shop and mechanic to mechanic. Sometimes the job is done with little more than a few hand tools and a well-pitched ear; at others it's turned out with enough diagnostic instruments to stock a flight engineer's panel.



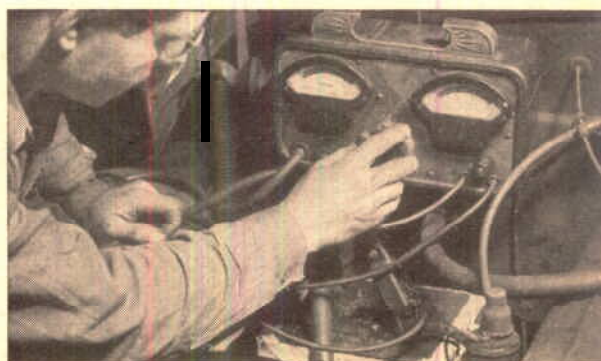
Instrument tests help spot trouble points quickly.

However it's done, the underlying idea is to restore some of the efficiency that the engine has lost through use and wear. These inevitably bring a gradual decline in engine performance; vibration jars precise adjustments out of kilter; contacts and electrodes pit and burn away; filters choke up with dirt or sludge; and friction and heat do the rest.

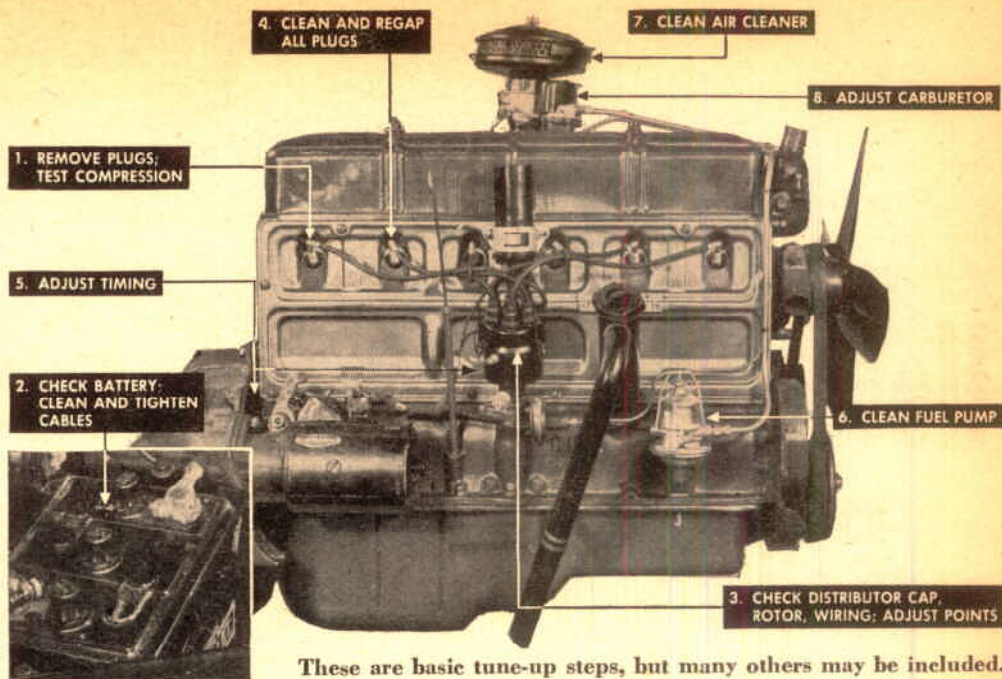
That's why your engine needs a going-over at regular intervals. The job should give you quicker starting, more power and pickup, better gas mileage, and smoother



1. A compression test comes first. An engine cannot be tuned satisfactorily if compression is uneven. In such cases, a valve or a ring job may be required before the tune-up.



2. Good ignition depends on a battery in good shape. Here each cell is being checked under load. Corrosion is removed from terminals and cables examined.



These are basic tune-up steps, but many others may be included.

idling. (In evaluating a tune-up your car has had, don't forget that the better shape it was in beforehand, the less improvement you'll notice.) A tune-up may also spot minor trouble before it becomes major, and for that reason alone is a good idea before any long trip.

The accompanying photos show a tune-up done by a competent mechanic with modern equipment. This was an actual job done on a 1946 Chevrolet by John Riccardi, tune-up specialist for the East Side Chevrolet Corporation in New York City, who in his own

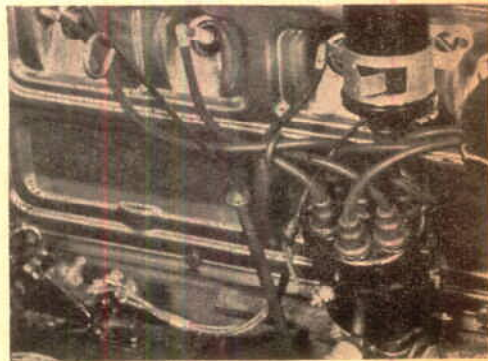
words "began as a kid" and has "been at it for 20 years."

Most automobile manufacturers recommend an engine tune-up each 5,000 miles or twice a year, in the spring and fall, but hard usage under difficult conditions may make it advisable even more frequently. Spring and fall tune-ups coincide with conditioning the car—oil changing, addition or removal of antifreeze, and so on—for the season that's to follow.

Tune-up may be considered to deal mainly with three engine functions—com-



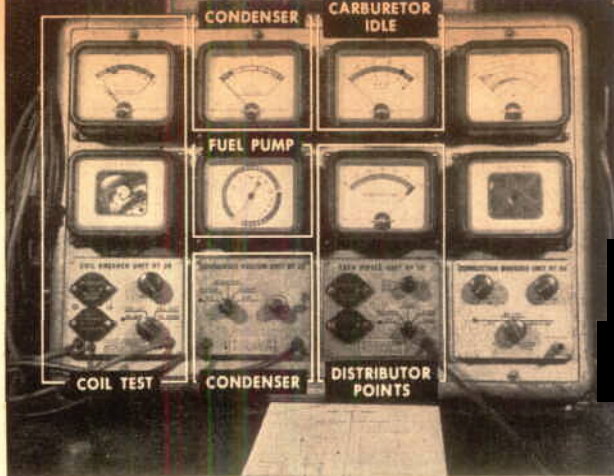
3. Spark-plug gap is set with a wire gauge, even when new plugs are installed as here. If old ones are retained, they're cleaned and inspected for cracks as well as regapped.



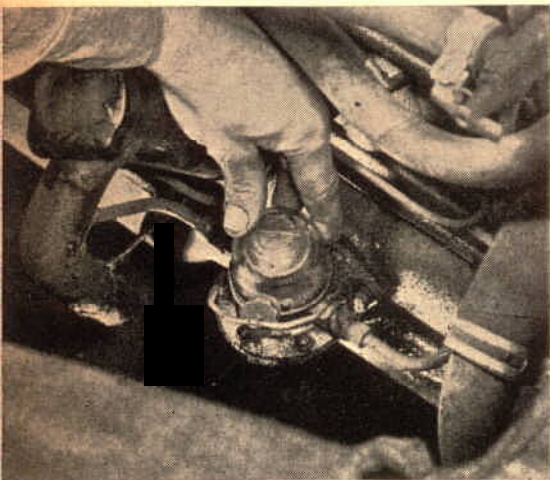
4. Distributor wires were all inspected for worn insulation. After removal, both the cap and rotor were checked for cracks, chips, and burning, and the cap wiped out with a cloth.



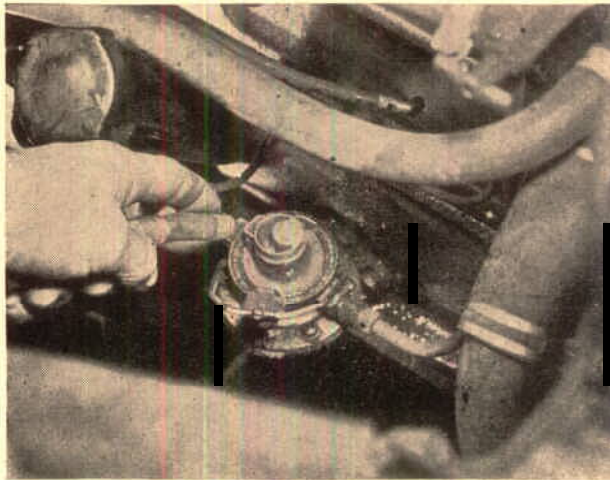
5. Contact points are removed from the distributor and cleaned with a fine-cut file. If the points are badly oxidized or pitted, new points and a new condenser are installed.



6. Degrees of dwell, registered on the motor tester, show whether point setting is correct. The machine also tests coil, condenser, fuel pump, and gives engine a final vacuum check.



9. The fuel-pump bowl is about to be removed here. The bowl was wiped clean and examined for cracks and chips, and the strainer freed of dirt with a blast or two from an air hose.



10. Water and dirt also were blown from the pump with a hose. A new gasket went into the pump when it was reassembled. The gas filter on the line at the carburetor was also cleaned.

pression, ignition, and carburetion. Each engine part affecting any of these is checked and then adjusted if necessary.

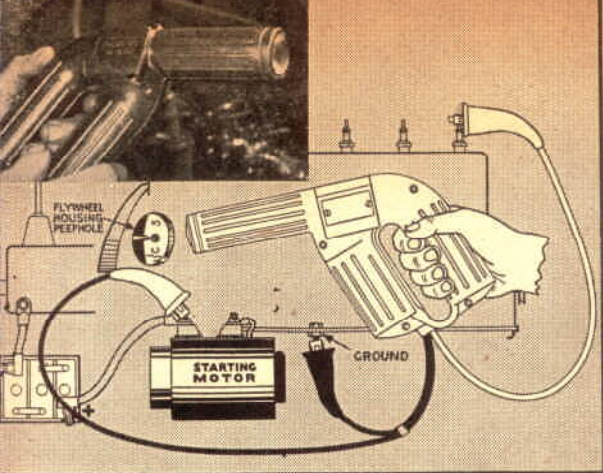
You may also have heard tune-ups classified as major and minor. As the word suggests, a major tune-up includes more steps than the minor. But there is no standardization. What one manufacturer or shop considers a minor tune-up may include steps that another may perform only in the event of a major job.

The tune-up illustrated here was classified as minor. However, the addition of only two other steps—overhaul of the carburetor and blowing out the fuel lines—would have raised it into the major class. In the photos,

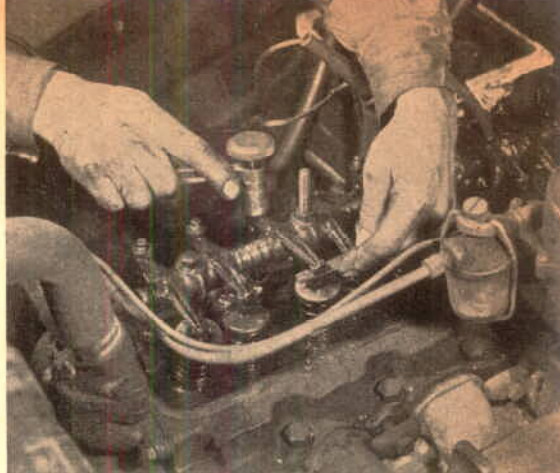
you will notice that the tappets were adjusted to the recommended clearances. This is a customary part of tune-up procedure for an overhead-valve engine. Although not illustrated, fan-belt tension also was adjusted, for slippage will affect generator output.

A more pronounced difference between a major and a minor tune-up is found in the factory recommendations issued for Buick. Here a minor job includes only four points—cleaning and adjusting the spark plugs, adjusting the distributor points, resetting the timing, and adjusting the carburetor.

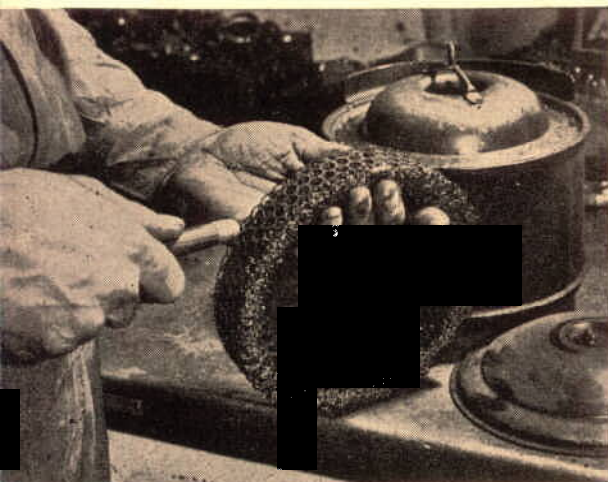
On the other hand, Buick recommends that a major tune-up should include adjusting the distributor points, timing, carburetor,



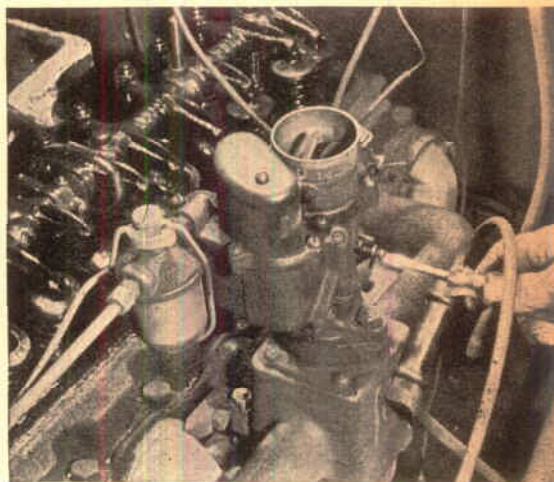
7. Ignition timing is adjusted by attaching a neon light to No. 1 plug, setting the octane selector at zero, and rotating distributor to line up flywheel mark while the engine idles.



8. Valve tappets were set at the recommended clearances with a feeler gauge and adjusting wrench as seen here. A new gasket was used when the rocker-arm cover was reinstalled.



11. Sloshed in kerosene to remove the dirt it had collected, the filter element of the air cleaner was blown dry. It then was dipped in clean oil, allowed to drain, and replaced.



12. Idle speed and mixture were both adjusted when the air cleaner was in place. (It was off here so as not to obstruct the photo). Notice hose connected to vacuum-test engine.

valve lash, fan belt, and voltage control; cleaning the air cleaner, crankcase ventilator, fuel filters, battery terminals, and spark plugs; checking the coil, condenser, distributor, vacuum spark advance, battery, automatic choke, and manifold heat control; and tightening the cylinder head, manifolds, and hose connections.

The testing equipment that's available also may extend the scope of the job. For instance, in the job presented here, the mechanic used an A. V. R. gauge to test the generator and voltage regulator (see top photo on page 142) after he had checked and cleaned the battery and terminals. In this shop the step is considered essential, for

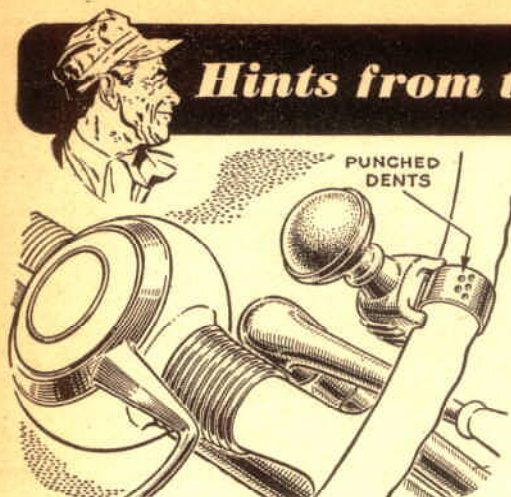
a generator output higher than the recommended maximum has a tendency to burn the points or damage the generator.

Some mechanics consider a lot of fancy equipment unnecessary, and they undoubtedly can give you an excellent tune-up job without it. But when properly maintained and honestly used, the testing equipment now seen in many shops can work to the benefit of both you and the mechanic by showing unmistakably what's needed.

At the conclusion of the tune-up illustrated here, a trained mechanic took the car out for a short road test. When he was satisfied, the job was marked okay for delivery to the customer.

END

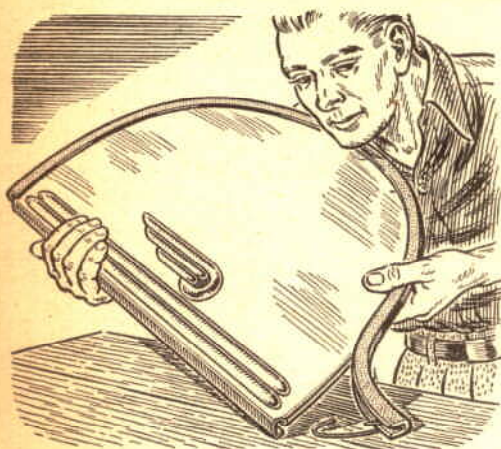
Hints from the Model Garage



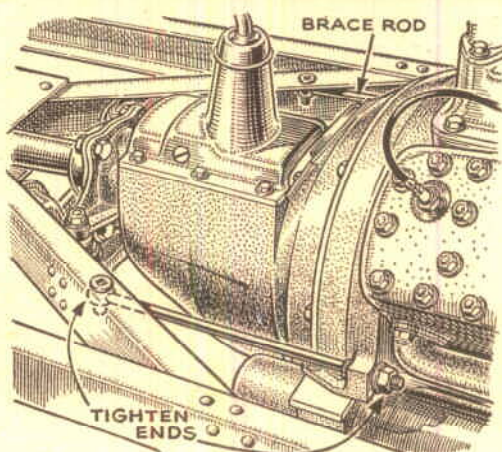
Steering Knob Kept Rigid. A spinner knob that twists in or out on the steering wheel can be cured by putting a few punch dots in the clamp. To avoid the possibility of cracking a plastic wheel, it's best to remove the spinner and clamp it on a broom handle or similar object. With a prick punch, make four or five dimples on opposite sides of the strap. When clamped, the spinner will remain in position permanently.—*Jim Sisley, Seattle, Wash.*



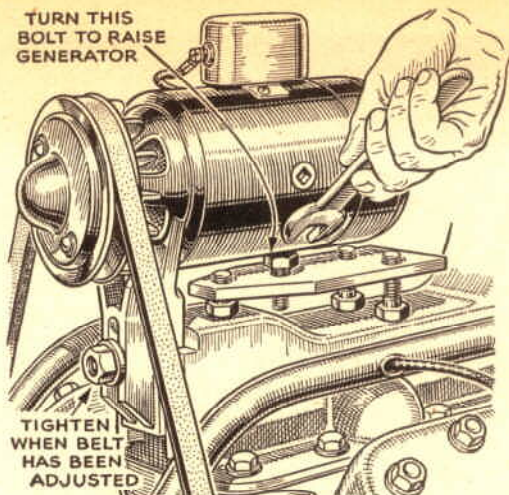
Light Does Double Duty. An accessory back-up light—the kind controlled by a separate switch—can be put to extra use as a direction indicator. Using red paint, I painted on the lens a big arrow pointing to the left. Now, when I'm making a left turn or pulling away from the curb, I flick the light on and off a few times. I've used the light for some time now and find it does its new job very nicely. It still gives ample light for backing.—*Ray Smiley, Detroit, Mich.*



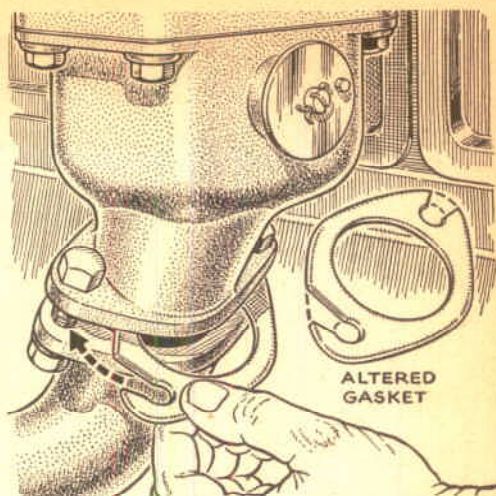
Replacing a Skirt Gasket. You can use a wide washing-machine cover gasket to replace a worn one on the fender skirts of some cars. Cut the rubber to length and stretch it around. Run a small wire hook through the inner side of each end. Fasten the hooks to the projections on the back of the skirt to hold the gasket.



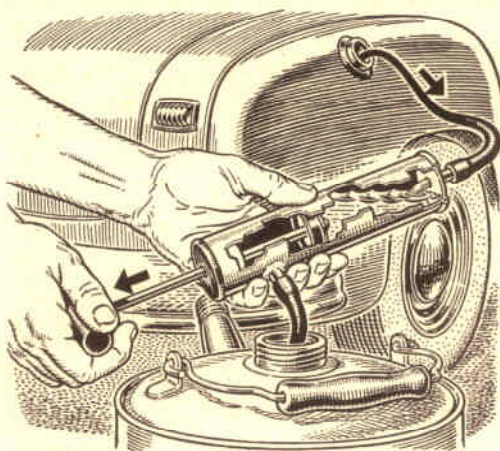
Keep Support Rods Tight. On prewar Ford V-8s, the two support rods that help anchor the engine at the rear have sometimes led to false diagnosis of clutch trouble. If the rods loosen up, the result is similar to clutch chatter. The remedy is simple: either tighten the rods or replace them.—*A. Zanelli, Clifton, N. J.*



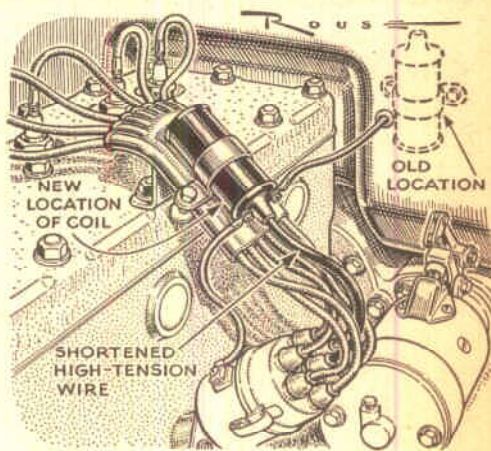
Tool Supports Generator. On some cars it's very tough to hold the loosened generator up in position while adjusting belt tension. The tool illustrated takes care of this. It consists of a piece of $\frac{1}{2}$ " steel plate tapped for four $\frac{1}{4}$ " bolts. Turning the one at the center with a wrench gives a powerful upward thrust, holding the generator at the desired level until the belt-adjustment nut can be tightened. Adjust the length of the leg bolts as required.



Gasket Slots Ease the Job. Narrow slots cut from the edge of a gasket to the bolt holes allow you to install a new one without taking out the bolts. This may be specially helpful on exhaust manifolds or other parts where bolthead clearance is scant, or where threads are so rusty that complete removal would be a time-consuming job. Just loosen the bolts enough to separate the flanges. The slots do not impair the efficiency of the gasket.



Spray Gun Siphons Gas. A siphon for drawing gas from a tank can be made out of an insect spray gun. Take out the plunger and reverse the cup leather. Cut off the spray container, enlarge the hole in the end of the cylinder, and solder in a piece of $\frac{1}{8}$ " copper tubing. Solder a delivery tube near the other end.



Short Lead Improves Starting. On an older-model Plymouth, I have found that moving the coil from the firewall to the spark-plug cable support makes the engine easier to start. In the new position, the high-voltage wire from the coil to the distributor cap is shortened considerably.—*Ralph Wyant, Indianapolis, Ind.*

Educational Tricks

Explain Car's Ignition

You can "make" a battery, hydrometer, ammeter, and spark coil.

By **Kenneth M. Swezey**

THE presto-chango stunts of the stage magician are trifles compared to what goes on in your car's ignition system.

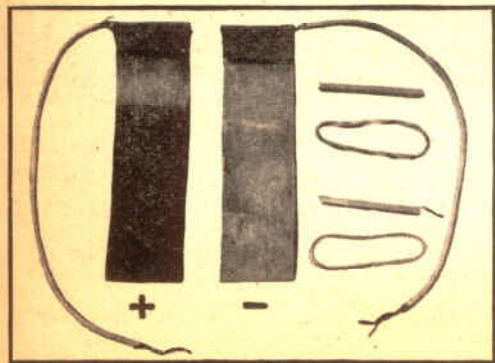
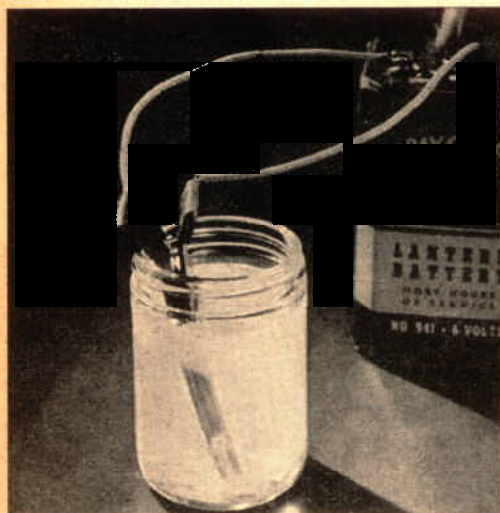
There, in the battery, you start with a chemical reaction that produces low-voltage electricity. This current, as it is, runs the starter, horn, lights, and radio. But you also wind up, via spark-coil sleight-of-hand, with 18,000-volt miniature lightning flashes in the cylinders.

Oddly, a storage battery doesn't really "store" electricity. It merely changes electrical energy into chemical energy and vice

versa. Its cells contain sets of porous lead plates; one filled with lead peroxide and another with spongy lead, immersed in dilute sulphuric acid. When the battery is discharging, the sulphuric acid reacts with the lead peroxide, forming lead sulphate. When the battery is charging, the sulphate is changed back into peroxide, and sulphuric acid is restored to solution.

The usual three-cell battery gives six volts. But the action of one coil that has only a few turns of wire on another that has several thousand times as many boosts this voltage to put sparks in the spark plugs.

These setups "expose" this magic.



An experimental storage battery can be made in a jiffy from two lead plates (clean with sandpaper), two matchsticks to hold them apart, rubber bands to hold the assembly together, and a jar containing 1 part sulphuric acid in 9 parts water. (Caution: always pour the acid into the water.) To charge the battery, connect the plates for 5 minutes, as above at left, to 2 to 4 dry cells wired in series. During charging, oxygen is released at positive plate and hydrogen at negative. Some oxygen unites with positive plate to form brown lead peroxide. (Note its darkness in photo at the left.) To prove that the chemical change made by electricity can also return electricity, connect a flashlight bulb to the plates of your charged battery. The bulb lights as above.



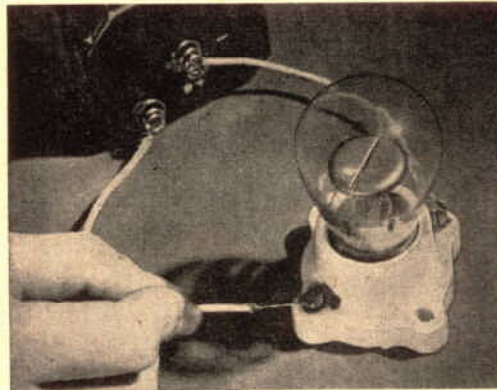
How a hydrometer indicates the state of charge in a battery can easily be shown. A hydrometer is a simple float-sink device for checking the density of a solution relative to that of water. Improvise one by weighting a small vial so it floats upright in plain water in a bottle. Mark the water level on a paper scale as seen at left. If you now slowly add sulphuric acid to water, vial will rise, as at right. When a battery charges, lead sulphate is changed to sulphuric acid. This increases the density, making the hydrometer float higher. On discharge, acid is removed, causing hydrometer to sink.



An ammeter keeps tabs on car battery circuit by telling whether battery is charging or discharging. You can show in principle how one works. Wind several turns of wire around a pocket compass. Then turn the compass so that needle is aligned with the turns. If you connect a flashlight cell in series with the wire and a

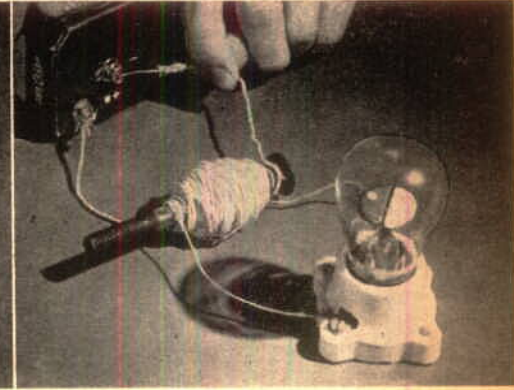


bulb, needle will swing to one side, repelled by magnetic field set up in coil. Now switch connections to battery, reversing direction of current flow, and needle will swing other way. This is what happens in car's ammeter. When battery is charging, current flows one way; when discharging, current reverses.



How a spark coil works. Without a coil to increase the voltage, the spark plugs wouldn't spark. As a demonstration, connect a 6-volt battery to a small 115-volt neon bulb, left. The battery alone won't light the bulb.

Now make a simple step-up transformer. Anneal an iron bolt by heating it red hot and letting it cool slowly. Wind 20 turns of bell wire smoothly on the bolt as the primary. Over this wind 400 turns of finer wire as the sec-



ondary. Connect the ends of the secondary to the neon bulb. Touch the ends of the primary momentarily to the battery posts. Each time you break the battery circuit, high voltage will be induced in the secondary coil. This will light up the neon bulb.

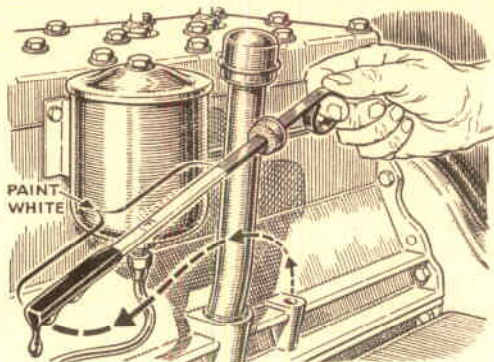
The same thing happens in a car's ignition system. A rotor in the distributor breaks the battery circuit. High voltage induced in the spark coil sends a spark across the plug gap.



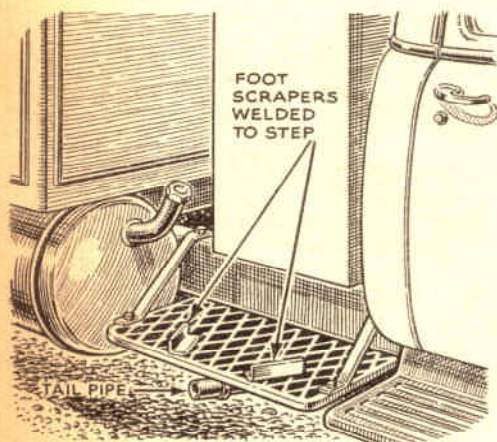
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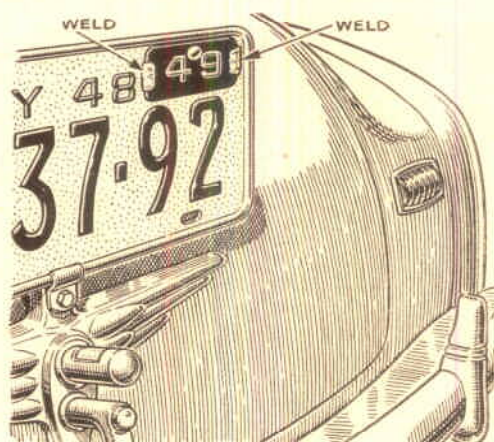
Oil Drained into Flat Can. Some new cars are so low that it's awkward to drain the crankcase without a lift. The job calls for a shallow but capacious pan, Victor H. Lamoy, of Upper Jay, N. Y., reports that an empty 2-gal. oil can with a large opening cut in one side gets under easily. Leave a lip around the hole to keep the oil from slopping when you drag out the filled can.



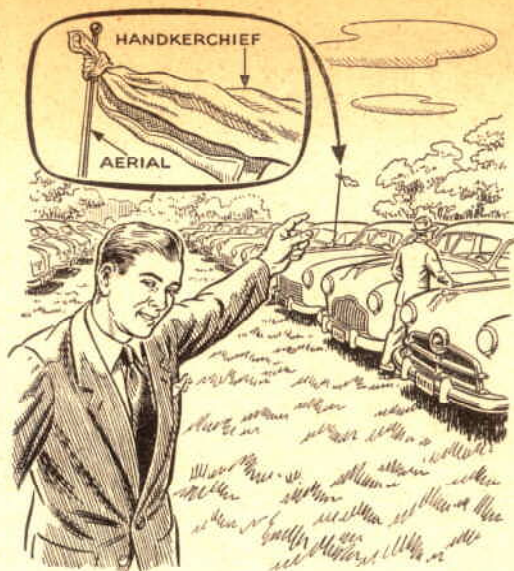
White Stick Shows Oil Level. It's always a little difficult to be sure of the oil level on a dark dip stick. M. M. Dierks, of Chicago, says a coating of white lacquer has taken care of the problem in his case. Before applying the lacquer, he scoured off all traces of oil from the stick and then cleaned it thoroughly with a wire scratch wheel to give good adhesion.



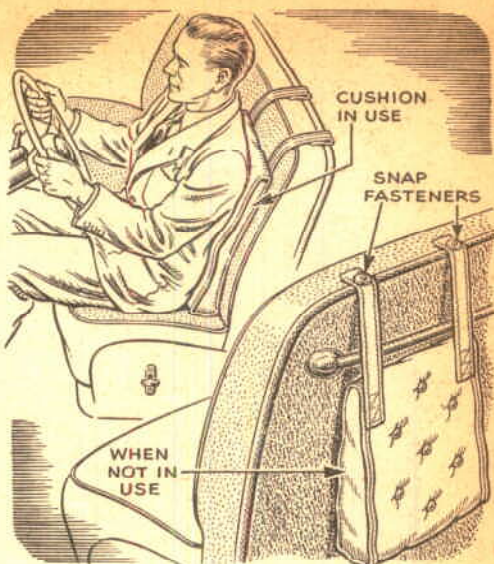
Foot Scraper Aids Safety. Wet mud is as dangerous on the step and floor of a truck cab as slippery ice. Operators of one Texas truck fleet welded foot scrapers on auxiliary steps just behind the regular ones to enable drivers to clean their shoes as they enter. To keep the step clear in winter, the exhaust line is piped underneath.



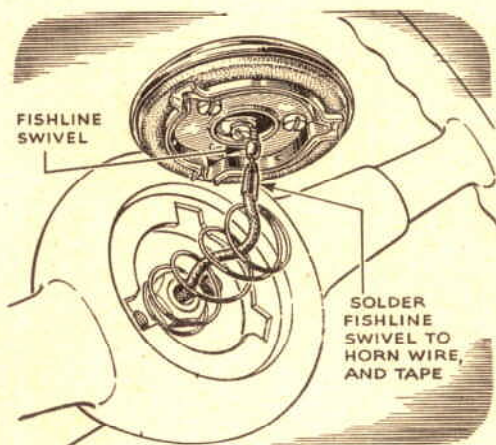
Welding Prevents Loss. To save metal, several states have adopted the practice of issuing small year tags for renewal of old license plates. To prevent loss or theft, you can tack-weld them to the plate. If carefully done, low-heat arc welding will not distort the metal nor burn more than a small, easily retouched area of paint.



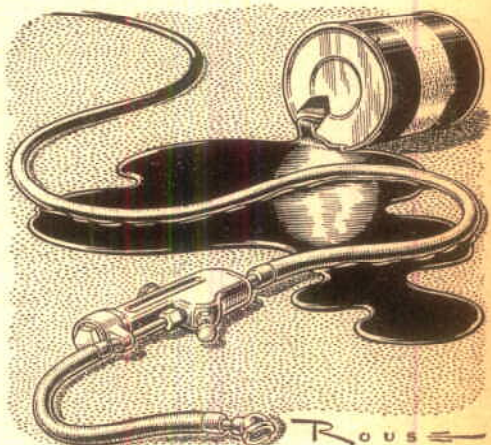
Handkerchief Tags Car. When you must park in a lot where there are hundreds of cars, as at the beach, ball park, or fair grounds, you can make it easier to find your car by extending the radio aerial to its full height. First tie a handkerchief or piece of tissue paper to its tip.



Back Rest Flips Out of Way. Does your wife need a cushion behind her to reach the pedals easily? Here's an excellent method of having the cushion always available but still out of the way when not needed. You may also find it handy yourself for changing your position on long drives.



Swivel Safeguards Horn Wire. In some cars the horn wire inside the steering column is subjected to considerable twisting. C. B. Hopkins, of Tacoma, Wash., found that this caused the wire on his 1941 Ford to break several times. A brass fishline swivel, taped as shown above, took care of the problem nicely.



Oil Rots Rubber. If you run a shop, you know the cost of air hoses, battery-charger cables, and other rubber equipment. One sure way of increasing this cost is illustrated here. Grease and oil cause rubber to disintegrate rapidly. So keep such equipment off the floor. It's also a good idea to wipe off the lines occasionally.