1. Jack up the car. That's the first step when tires or tubes are fixed at the General Tire shop in New York without removing wheel from car. The jack lifts two wheels off the ground.

How an Expert Fixes a Flat

In this shop, they do the job without taking the wheel off the car—and they can do it in less than four minutes.

By R. P. Stevenson

PS photos by W. W. Morris

ONE day this spring a motorist drove into a tire shop on New York City's West Side. His car was secondhand, a recent purchase. Its rubber seemed good but he wasn't sure about the tubes.

Two tire men went to work when he ex-

2. Break outer bead. After letting out the air and sloshing liquid soap around rim and bead, mechanic frees outer bead with tire iron and hammer. Hammer never hits side wall, however.

3. Now free the tube. With the outer bead off the rim, he stretches tire toward himself to pull valve stem from the rim. He also checks to make sure tube isn't sticking to the rim.

4. Loosen the back bead. Several hearty tugs loosen the inside bead and it's then an easy matter to pull tire from the rim. Entire job up to this point took 1 min. and 40 sec.

5. Put in the tube. After being given a shot or two of air, a tube is shoved into casing. Mechanic's weight spreads tire enough so he can put in ordinary tube without difficulty.

plained that he'd like to check the tubes. One slid a hydraulic jack under the frame at the middle of the car and tilted it, raising a front and rear wheel off the ground. The other got together a few tire irons, a couple of hammers, and two battered old cans—one containing liquid vegetable soap and another filled with a greaselike substance.

Then both turned to the wheels, one at the front, one at the rear. Not bothering to pry off the hub caps or unscrew the lugs, they let the air from the tires, made a few passes with a tire iron, and dragged off the casings—leaving the wheels on the car.

With the casings and tubes inspected and a new tube installed, the tires were mounted again in a jiffy. After a repeat performance on the opposite side of the car, plus similar attention to the spare, the job was done.

Just a little more than ten minutes after entering the shop, the motorist drove away.

Such speedy service is a common occurrence at the shop of the New York General Tire Company. The secret lies in the fact that the job is done without removing the wheels from the car.

The procedure was adopted during the war, when both time and help were short. It proved such a time-saver that the company made it standard practice. Today, mechanics at the shop take pride in the speed with which they do the job.

At the outset, other tire men threw up their hands, said it was a bad idea. How could you, they asked, remount the tire without pinching the tube?

But General does it. In the years the shop has been mounting tires in this way there have been only a couple of returns for failure because of pinched tubes.

You can see how it's done in the accompanying series of photos. If you're an old grunt-and-strain tire hand yourself, it may be a surprise to learn that the job is done with such little effort and so few tools.

There's no reason you can't do the same thing yourself. Here's one caution. Be sure you have a good jack, one that will let you exert pressure without knocking the car down on your toes.

The General shop has elaborate equipment and labor-saving tools, as the photos on page 68 show, but the quick-change job is done with just the things that any motorist might lay his hands on.

In this, you have the key to the character of a real expert. He uses his tools, but doesn't depend on them to do the whole job. To the tools, he adds the skill of his hands and feet—plus a liberal amount of common sense.

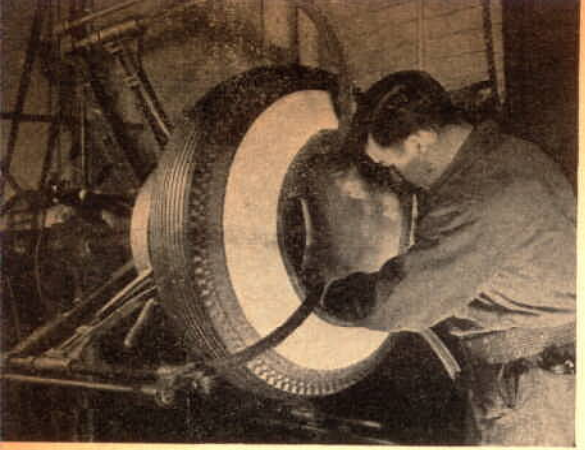
In the quick-change tire job, these are exactly the ingredients you'll find. Taken together, they add up to a task well done.

6. Apply lubricant. A vegetable compound in paste form is applied to tube and bead with a brush. Acting as a lubricant, this allows the tube to seat properly, prevents rust on rim.

7. Pry on back bead. A tire iron quickly slips the inside bead over the rim after the valve stem has been lined up. When bead is on, the mechanic starts the stem through its hole.

8. Heave ho—and it's on. Here's the key to the job. Using one iron, plus knee and arm pressure, mechanic quickly works bead into its well. He presses with knee while turning tire.

9. Some air, and job's done. Holding the stem with his thumb, he puts air in the tire before removing jack. This job took less than 4 min. Some mechanics in the shop work still faster.

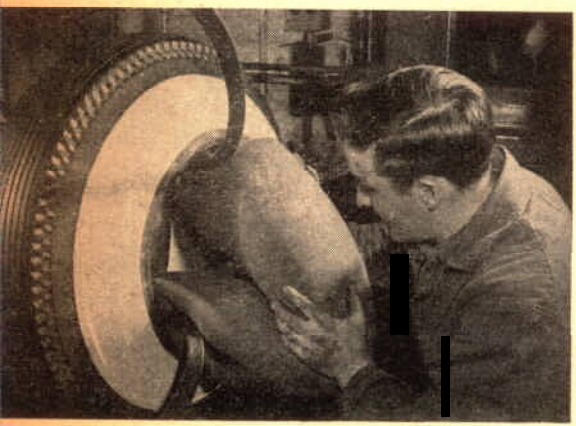


Tire spreader operated by air pressure pulls the side walls far apart. With a used tire, this enables the mechanic to spot any cuts or breaks in the fabric on interior of the casing.

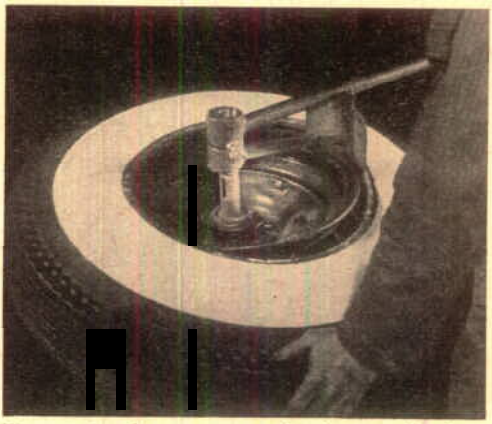
Specialized Tools Aid Tire Mechanics

ALTHOUGH changing a tire without removing the wheel saves time, it's sometimes necessary or convenient to do the job the old-fashioned way. At the New York General Tire shop, however, you'll find equipment that's anything but old fashioned.

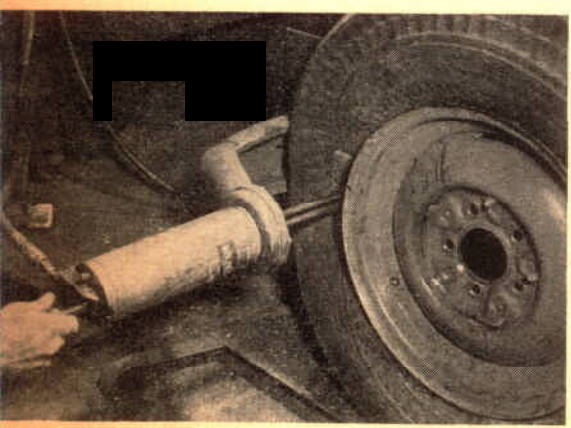
Some of the shop's labor-saving tools are shown in these photos. Several are used in almost any tire shop. Others are not so common. In addition, the General shop has complete equipment for balancing wheels, an important step in these days of lower tire pressures. And for truck work, there's a big air hammer to loosen stubborn beads.



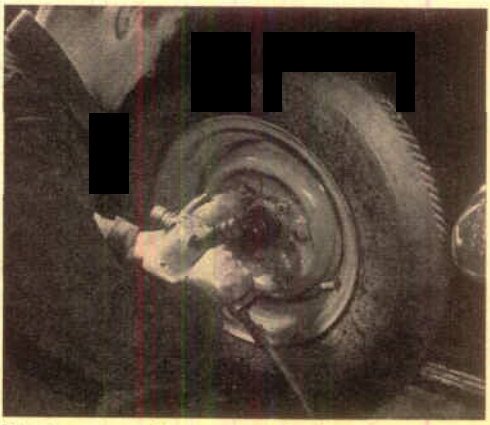
Spreader also is used for easier insertion of the puncture-proof tube made by General. This tube is much heavier than the ordinary type, and it's difficult to insert in usual way.



Greasy hands never touch white wall when the mechanic uses this tool. It consists of pedestal with a shaft to hold wheel. Turning the guide once around slips the bead on the rim.



A bead "frozen" to rim after long use quickly yields to this air-operated tool. As valve is turned on, a pressure foot kicks tire inward. Several strokes around the tire loosen bead.



Torsion wrench turns up the lugs to an exact tightness. They're tight enough to be safe, but still can be loosened with an ordinary lug wrench if you're caught with a flat. END

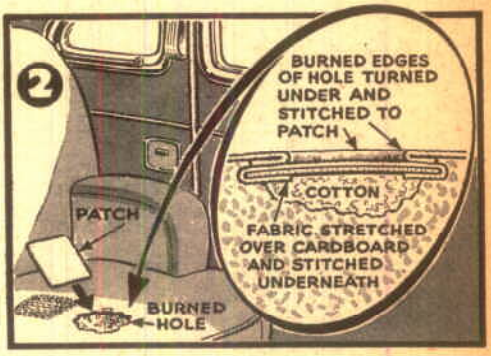
AUTO HINTS

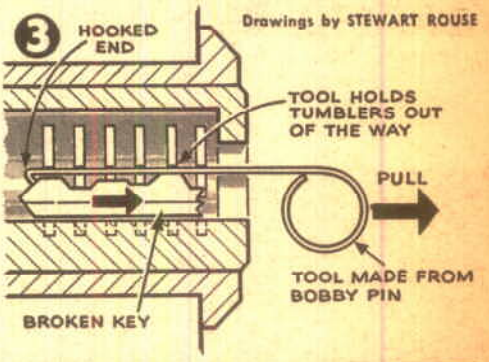
1 *Boxes Hold Garage Shelf.* A sturdy shelf may be quickly put up in the garage by nailing two boxes of equal size to the wall and then nailing a wide board across them. The boxes themselves also provide storage space.—W. H. McClay.

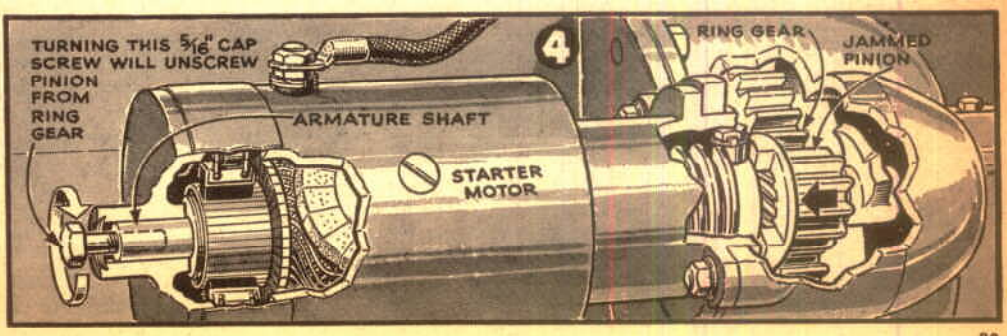
2 *How to Patch Upholstery.* To repair small holes in car upholstery, cut a piece of matching material about twice the size of the hole, place this over a piece of cardboard ½" larger than the hole, turn under the edges, and sew or cement them fast. If the inside padding of the cushion has been damaged, fill the cavity with cotton. Then work the patch into the hole, turn the edges of the burned area under, and stitch to the patch to give a snug fit.

3 *Pin Removes Broken Key.* A bobby pin, straightened and then bent to give it a small hook on the end, can be used to pull a broken key from a car lock. The pin holds the tumblers out of the way, letting the key be withdrawn.—S. Wooler.

4 *Screw Unlocks Starter.* If a starter has a habit of jamming, a 5/16" cap screw placed permanently in a hole drilled and tapped in the end of the armature shaft will enable you to loosen the jam quickly. In a starter of the type illustrated, turning the screw clockwise will pull the jammed pinion free from the ring gear. Remove the starting motor to drill the hole. It will also be necessary to drill a clearance hole in the dust cap.—N. W. Goodwin.







New Soft Tires Absorb the Bumps

Here's what to think about if you're planning to put them on your old car.

By R. P. Stevenson

IF YOU remember putting 60 lb. of air into the tires of an old Model T, it may seem surprising that a pressure of 24 lb. can support a modern car. But it does in the new soft tires. The result is the smoothest ride you've ever had.

First announced only a few years ago, the low-pressure tires are now original equipment on many new cars. At present, they're a luxury, but growing production should scale down the price.

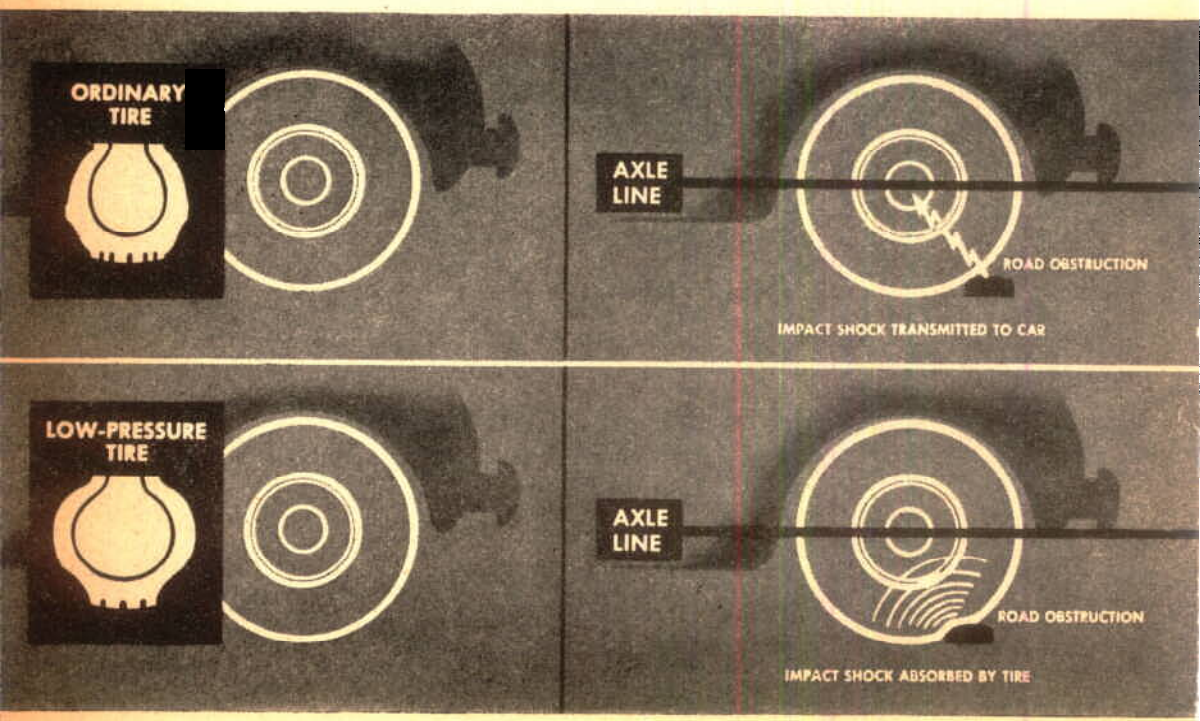
It should be noted that these are not the oversize tires sometimes used in the past for better cushioning. Such tires were just a larger size of the ordinary type. They were never fully satisfactory because of such disadvantages as hard steering, irregular wear, and excessive unsprung weight.

The new tires were designed and engineered specifically for a greater volume of air at lower pressure. In cross section, they are wider and a little higher than the corresponding old sizes they replace. From the side, they look much the same.

In addition to a softer, smoother ride, advantages claimed for them include better traction, greater safety, more positive steering, cooler running, less road noise, and—surprisingly enough—slightly better mileage. How they envelop a road obstruction is illustrated in exaggerated form below.

You can use the new tires on an old car, but here's a warning: You'll get some, but possibly not all their advantages. Some tire engineers contend you'll get full benefit only by mounting them on wider rims. Present rims may pull in the designed width of the tire, reducing the air volume and consequently the cushioning effect.

On older cars, the cost of installing new wheels would be considerable, leaving little alternative to using your present rims.



Before planking down the cash, however, make certain the tires have adequate clearance. In extreme cases, you may find that rear ones rub against the metal of the wheelhouse. Clearance also may be so slight that you can't use chains. The front tires may touch the fender or frame on short turns. It's also worth checking whether your present spare-tire carrier will accommodate the greater bulk.

If you wish, you can start with just two of the tires. But install both of them either at the front or at the rear, not one in front and one at the rear. The best choice appears to be to mount them at the front. Car stability is apt to be reduced if they're put on the rear only.

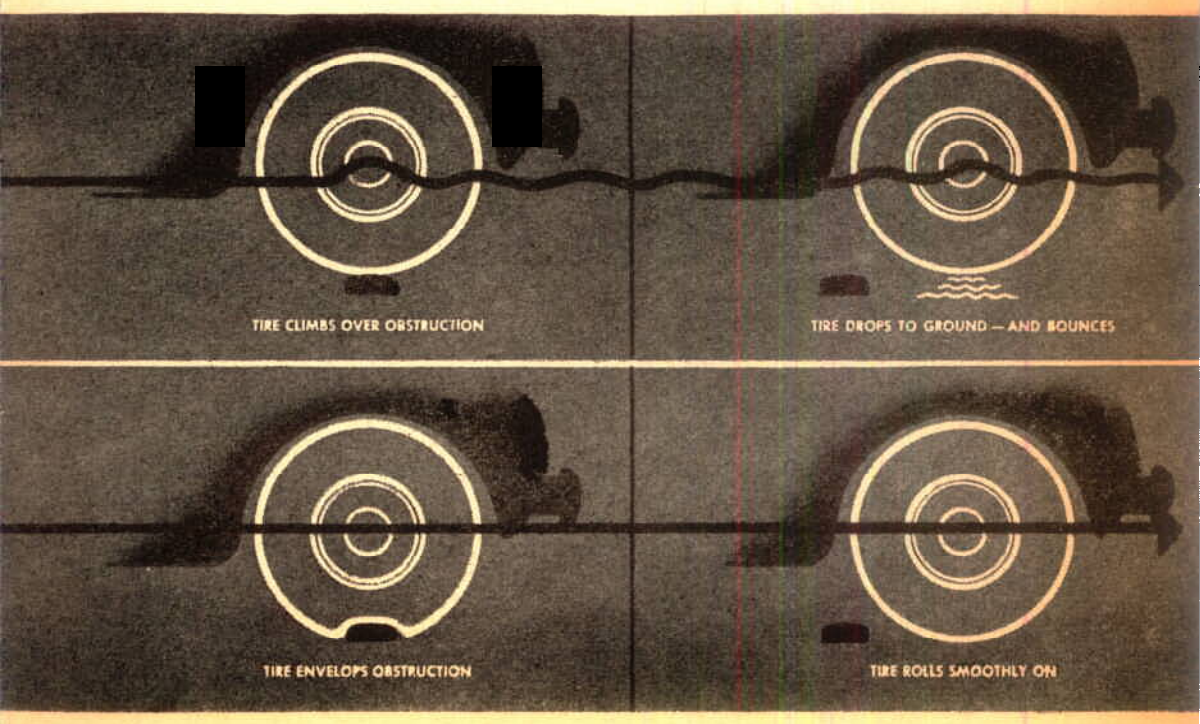
A change to the new tires will have a few adverse effects. Acceleration will be slower because the larger tires increase the circumference of each wheel. (Incidentally, this may throw off the speedometer.) Since the tire is softer, its footprint is longer. This greater area in contact with the road improves traction, but you'll have to exert more steering effort while parking. In at least one case, the footprint area has been kept down by making the tread narrower.

The old admonition to keep your tires properly inflated has never been more important. Since the recommended pressure for the new tires is lower, two or three pounds difference amounts to a greater percentage than at conventional pressures.

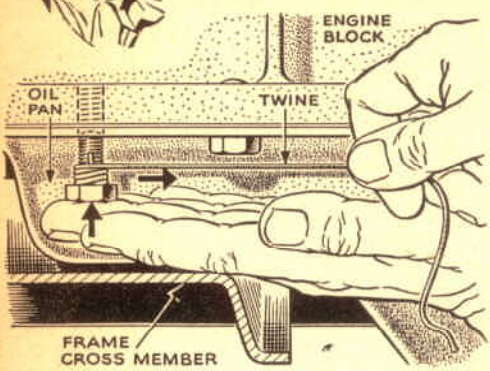
When the tires are used as replacements, pressure recommendations may vary either way from 24 lb., depending on the make, model, and year of the car—and of course the size of the tire. Therefore, in buying a replacement set, be sure the dealer has authorized pressure recommendations to suit your case.

One large tire manufacturer is now cautioning service-station operators to be on the lookout for the new tires and not overinflate them unwittingly. Until this campaign has had time to take effect, you'll have to shoulder the responsibility of seeing that someone doesn't run wild with an air hose.

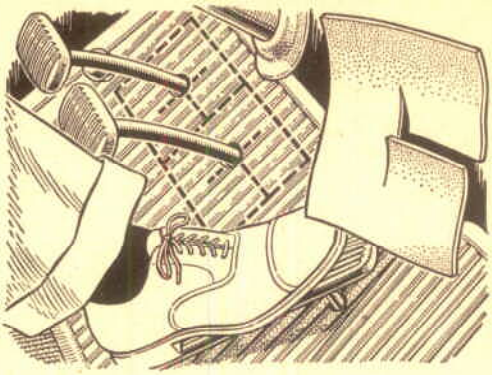
Size designations adopted for the new tires show the true cross-section measurement—the distance from side to side when the tire's inflated. For instance, 7.60 means exactly that—7.60". On the other hand, the corresponding tire that it replaces, a 6.50, actually measures 6.80". The latter discrepancy is found throughout the old size range. In general, the new tires take standard lightweight tubes one size larger than the tires they replace. END



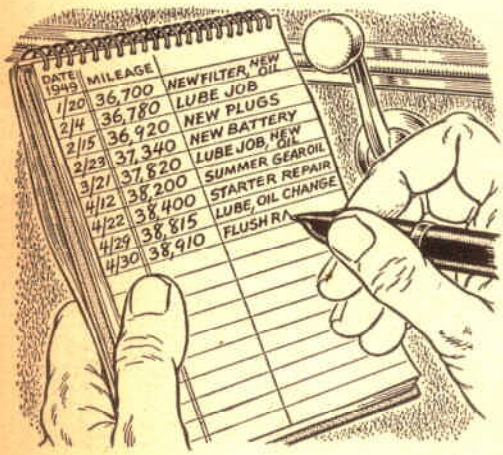
Hints from the Model Garage



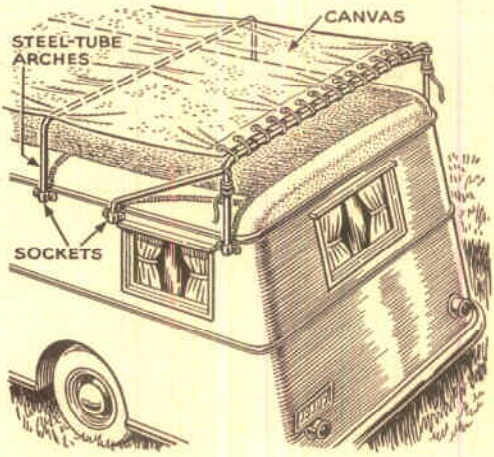
Twine Starts Bolts. Ben H. Clare, of Wellsville, Mo., suggests you use twine the next time you have to start a bolt in a hard-to-get-at spot. Wrap the bolt with twine, hold it in place with a finger or screwdriver and pull the twine. Sometimes it may be necessary to taper the end of the bolt.



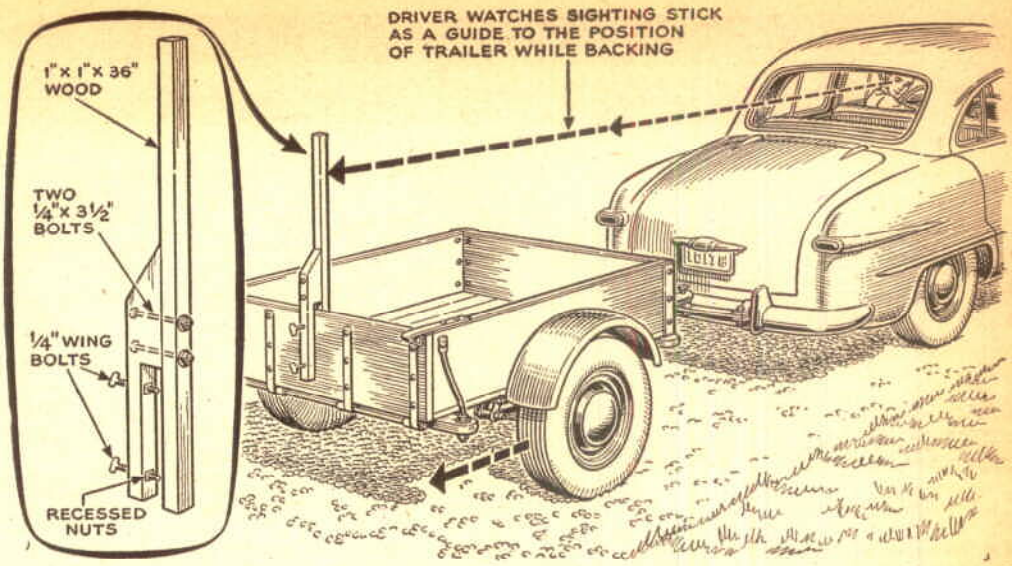
Floor Pads Stop Drafts. Wind that blows in around the shafts of the clutch and brake pedals can be stopped by pieces cut from an old inner tube or step pad. F. W. Marasco, of McKeesport, Pa., writes that it isn't necessary to secure the slit pieces if you cut them large enough.



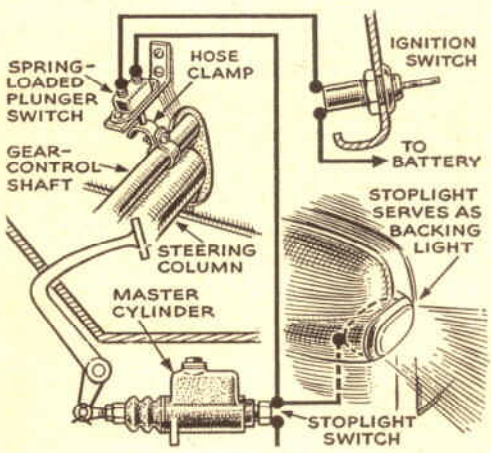
Keep an Auto Log. Adapt the idea of the airplane flight log to your car. Plane owners keep a careful record of engine checks and repairs, among other things. Put a notebook in the glove compartment and record lubrication, servicing, and overhauls. A date and mileage record of performance troubles, unexplained noises, or the like is often a source of clues for trouble shooting. A log also gives you a record of expenses.



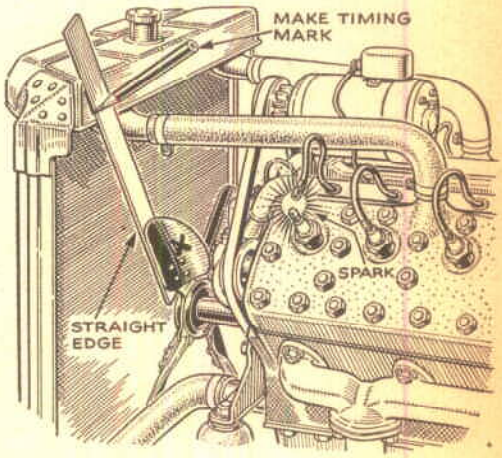
Awning Shades Trailer Roof. The interior of a parked trailer often becomes unbearably hot when the summer sun beats directly on it. To remedy this condition, A. V. Malone, of Los Angeles, built the shade shown above. It's canvas stretched over steel tubes that fit into sockets on the trailer. Mounted about 12″ above the roof, it has open sides for air circulation, lowering the inside temperature 10 to 20 deg.



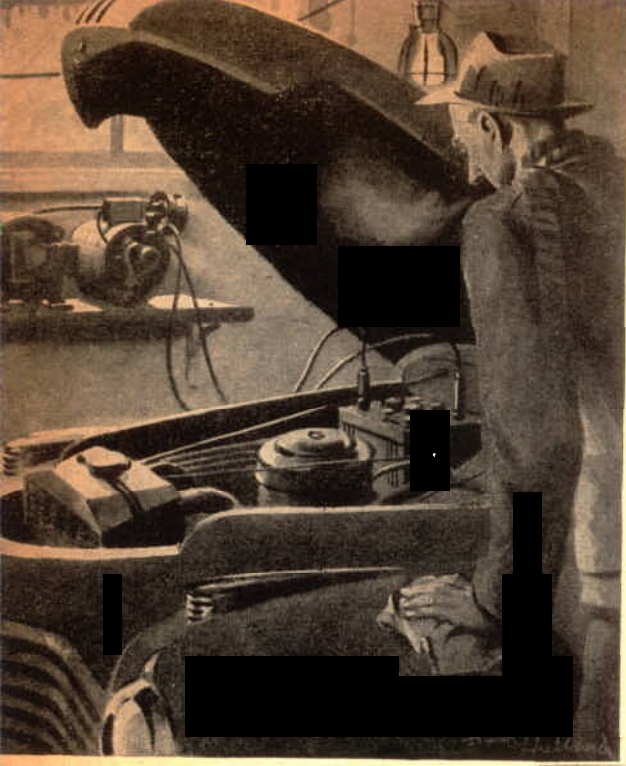
Guide for Backing Trailer. Anyone who has ever backed a two-wheel auto trailer will appreciate this simple guide to its direction. Suggested by Ralph S. Wilkes, of Keuka Park, N. Y., the directional guide is an upright hardwood stick about 1" square by 3' long and a clamping device. If you can't buy the wing bolts, make your own by heating the heads of ¼" or ⅜" machine bolts and flattening the heads with a hammer. The nuts are set into square recesses chiseled in the wood.



Light for Backing Car. F. W. Atwood, of Danvers, Mass., wired his stoplight so it serves also as backing light. He mounted a spring-loaded switch on the firewall and a hose clamp on the shifter rod. Shifting into reverse turns on the stoplight. It's wired through the ignition so the car can be left parked in reverse. The motor can be started without the key (with shift in reverse and brake on), but this does no harm.



Ignition Timing Kink. Here's an easy method, writes H. W. Mills, of Albion, Ill., for checking the timing of a car with a direct-drive fan. Slowly crank the engine with the ignition on after disconnecting No. 1 spark plug. When you get a spark, use a straightedge on a fan blade to mark a spot on the radiator. Also identify the fan blade as well. This is mainly useful if one mark is made when the timing is just right.



MOTOR

This Homemade Charger

ONE of the simplest and most dependable ways of charging storage batteries is with a motor-generator set. Readily assembled from a shop motor and an old auto generator, the unit affords an easy means of putting new pep into car batteries to meet heavy wintertime drain. It will also serve as a convenient D.C. supply for home electroplating, running a two-rail model railroad, charging electric-boat batteries, and the like.

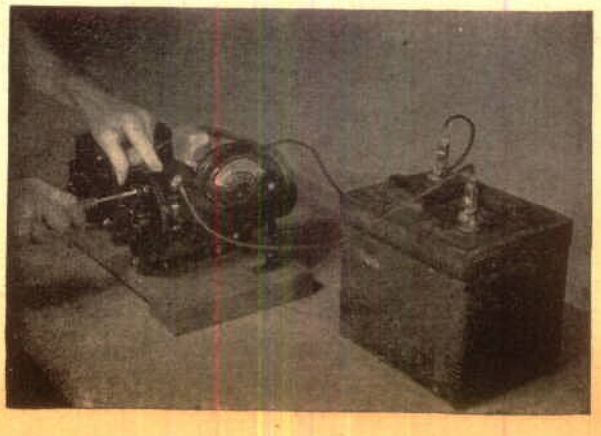
The complete unit, shown in Fig. 1, consists of a ¼-h.p. split-phase motor, a generator picked up in a junkyard for $3, and a one-to-one V-belt drive. It will deliver a continuous 8-amp. charge without overloading the motor; and the rate could be increased to about 13 or 14 amp. by the use of a ½-h.p. motor. The generator is one of the older type employing third-brush regulation which was widely used on several makes of popular cars. In shopping for a suitable generator, don't buy a heavy-duty type unless you are prepared to supply the power to drive it efficiently. Pick one that appears to have good bearings and a commutator that is free of grooves and deep pits. You'll probably have to take a chance on the condition of the windings, since there's little chance to test them in most junkyards. If possible, get one with a cutout in good condition.

After cleaning up the generator case, inspecting the brushes, and lightly sanding the commutator, set up the generator temporarily for testing, and drive it at 1,700 or 1,800 r.p.m. If it is possible to determine direction of rotation from evidences of the way the generator was mounted in a car, it should of course be driven in that direction; if you cannot tell, try both directions to see which way it will build up current.

Sometimes it may be necessary to "flash" the generator to start the building-up process, that is, to short-circuit the generator for an instant while it is running. Connect a jumper

1 The complete unit, consisting of a shop motor, an old generator, a cutout, and an ammeter, is pictured here in finished form, charging an automobile storage battery

4 Adjustment of the charging rate in a three-brush generator is made by loosening a screw and then pushing the third brush with a finger. Retighten screw to lock



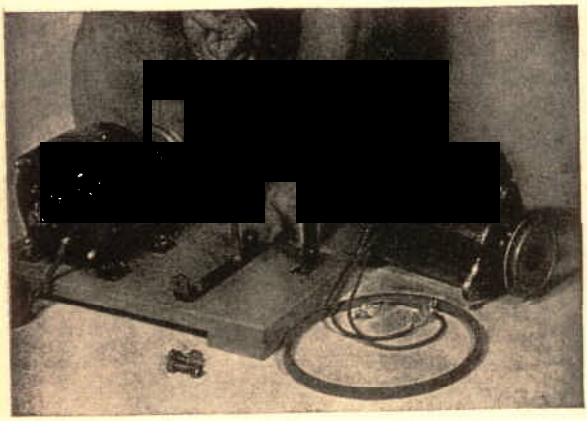
GENERATOR SET

Will Be Invaluable in Boosting Winter-Weakened Auto Batteries

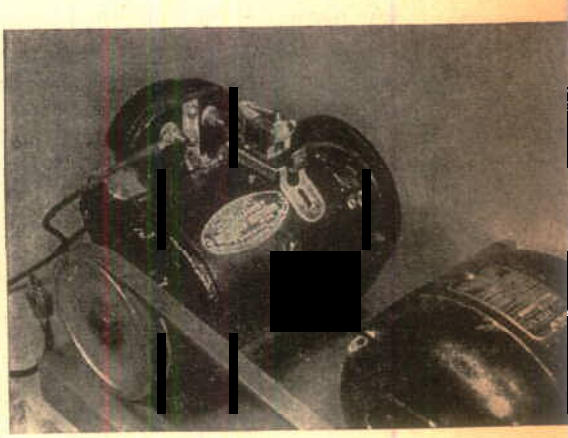
to the frame and touch it briefly to the input terminal on the cutout. If this doesn't work for either direction of rotation, try flashing the fields from an outside source. To do this, lift the insulated brush (the one that supplies output) and connect a storage battery with one lead to the frame and the other to the third or adjustable brush. With the generator idle, make several short applications of the current; then replace the lifted brush and try the generator once more. If it still doesn't generate, the only thing to do is to take it apart and test each component separately.

The armature may be tested for shorts or open circuits in a growler; if you don't have one, the job can be done in an auto service station. The field should also be inspected for open circuits and grounds by means of a series test lamp, as in Fig. 5, and the brush-holder assembly may be similarly tested, as in Fig. 6. Make sure that the ground connection from field to frame is clean and tight, that the insulation of the leads is in good shape, and that the bearings are not so worn as to permit the armature to touch the field poles. While you have the generator apart, it's a good idea to undercut the commutator and to turn it down in a lathe if the surface isn't smooth.

As soon as you have made sure that the generator builds up, mount it permanently with its motor on a wooden base. The original mounting bracket can be utilized by attaching it to the base with 5/16" machine bolts. A slotted arm, also secured to the base, will allow you to adjust belt tension. Details of the mounting method are shown

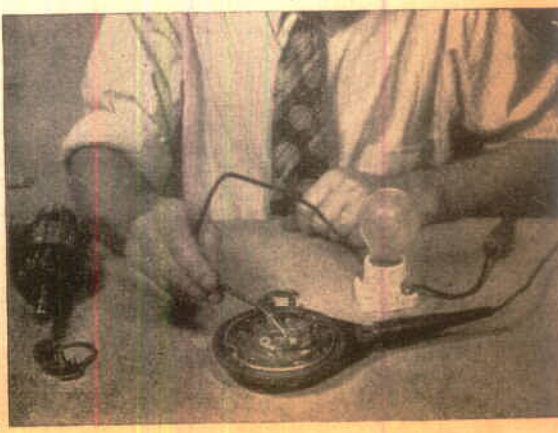


2 Here the mounting bracket originally used on the car is being affixed for holding the generator. A slotted upright helps in adjusting belt tension

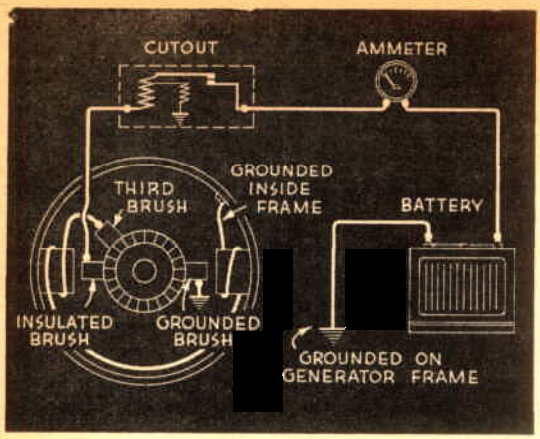


3 A standard generator cutout is needed if the unit is used to charge batteries, because it gives protection if the motor should be stopped

5 If the generator fails to build up current, the field can be checked for a possible ground or a broken circuit by the use of a series test hookup



6 A series test lamp will also come in handy in making certain that one brush is grounded and the other two aren't. Replace them if badly worn



Three-brush generators were once common on light cars

in Fig. 2. About 1,750 r.p.m. is a good generator speed; if you use a motor of higher or lower speed, select pulley sizes that will produce this.

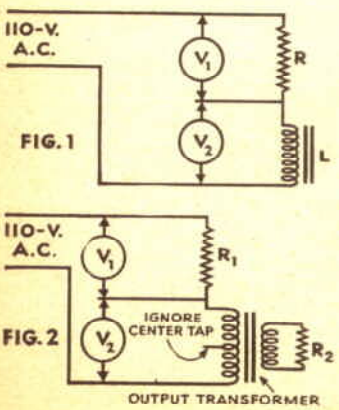
The circuit diagram of a three-brush generator is illustrated above. Note that one brush and one end of the field are grounded, that the other end of the field connects to the third brush, and that the insulated brush supplies the output in conjunction with the ground. If you plan to use the motor-generator set to charge batteries, be sure to use the cutout, since it protects the battery against accidental discharge if the power to the motor should be cut off.

In wiring the unit, run the insulated-brush lead to the cutout, where it should be attached to the terminal that is connected to one end of the heavy winding in the cutout. The other cutout terminal is connected by a short wire to one side of a small ammeter, to the other terminal of which is attached a wire terminating in an alligator clip. The other main lead runs from a ground on the generator frame, made by drilling and tapping for a 10-32 screw, and ending in another clip. Take pains to make all connections as clean and tight as possible, and use fairly heavy wire.

Before clipping the leads to a battery for a charge, determine the polarity of the charging line. This may be done with a D.C. voltmeter, or by placing the clips in a glass of salt water with the generator running. Bubbles will collect around the negative clip, which is the one attached to the negative battery terminal. Mark each clip with a plus or minus sign for future reference. Incidentally, do not ever run the generator for more than a few moments without attaching a load across it, because the voltage may build up to a value that will damage the field coils.

The charging rate may be adjusted by moving the third brush. Fig. 4 shows how, by loosening a clamping screw, the brush can be moved with the fingers. Pushing it in the direction of rotation increases the charging rate. To determine how much the rate may be advanced without overloading the motor, connect an A.C. ammeter in series with one motor lead. Then, with the generator charging a battery, advance the third brush until the motor ammeter reaches the figure stamped on the motor plate as the full-load current.

MEASURING IMPEDANCES



With the aid of an ordinary A.C. voltmeter, it is fairly easy to measure the actual impedance value of chokes, output transformers, and large paper condensers. If you have an inductance-capacitance-impedance-frequency chart, the impedance measurements so determined can be converted to henries or microfarads.

In Fig. 1, R is a known resistor approximately equal to the impedance of the inductance but, to prevent overheating, not less than 2,500 ohms, while L is the choke to be measured. Read V_1 and V_2 with the A.C. voltmeter; then use the following formula:

$$\text{Impedance of L in ohms} = \frac{R \times V_2}{V_1}$$

If R is 4,000 ohms, V_1 is 88 volts, and V_2 is 22 volts, then

$$L = \frac{4{,}000 \times 22}{88} = 1{,}000 \text{ ohms.}$$

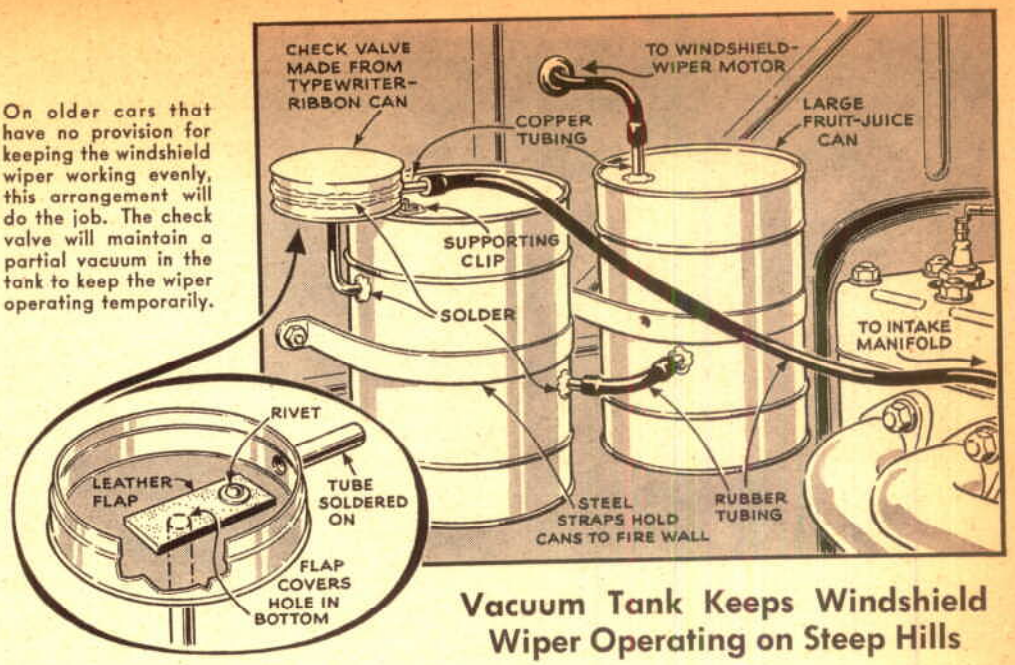
When impedance readings are made on transformers, the secondary must be loaded with a resistor of the value of the speaker voice coil normally used. The correct pair of secondary taps to match an 8-ohm speaker to a required output can be determined by measuring the impedance of the transformer with an 8-ohm resistor across different secondary taps.

In Fig. 2, R_1 is a known resistor approximately equal to the impedance of the transformer but, to prevent overheating, not less than 2,500 ohms, and R_2 is a resistor equal to the impedance of the normally used speaker voice coil. For push-pull transformers, use the two plate taps and ignore the center tap. Then, as with chokes, read V_1 and V_2 and use the following formula:

$$\text{Impedance in ohms} = \frac{R_1 \times V_2}{V_1}$$

If R_1 is 8,000 ohms, R_2 is 8 ohms, V_1 is 60 volts, and V_2 is 30 volts, then impedance $= \frac{8{,}000 \times 30}{60} = 6{,}666$ ohms.

On older cars that have no provision for keeping the windshield wiper working evenly, this arrangement will do the job. The check valve will maintain a partial vacuum in the tank to keep the wiper operating temporarily.



Vacuum Tank Keeps Windshield Wiper Operating on Steep Hills

UNLESS equipped with a compensating valve, a windshield wiper will frequently slow down or stop whenever the throttle is opened up. This annoying and sometimes dangerous habit can be overcome by installing a tank and check valve in the wiper line to maintain a partial vacuum for the few seconds needed to keep the wiper working evenly during the slack periods. The tank should have a capacity of about 1 gal.

Two tall fruit-juice cans will give you approximately this capacity, and a check valve can be made from a typewriter-ribbon box. Cut two ¼" holes in each fruit-juice can at the points indicated, drain out the juice, and rinse with water. Solder short copper-tubing nipples in three of the holes and a longer L-shaped nipple in the one near the location of the check valve.

Two holes also are required in the check-valve can, one in the side for a nipple to accept the tubing from the intake manifold and another centered in the bottom to take one end of the L-shaped nipple. After the latter nipple has been soldered, remove any excess so that the leather flap valve will close tightly. Clamp the cans to the fire wall and connect the nipples with rubber tubing.

Axles for Homebuilt Trailers Have Coil-Spring Suspension

AXLES and spring suspension units are being produced by the Industrial Machine Tool Co., Inc., of Fenton, Mich., especially for craftsmen who want to build their own trailers. Of all-welded construction and manufactured of tubular steel, the axles are available in either the straight type or with 4" drop for most standard wheels.

Two coil springs are contained in each suspension unit, providing four springs per axle. Although assuring a positive cushion to the trailer load, this type of springing eliminates any rocking motion. The axles have the standard 58" tread, but wider ones may be obtained on special order.