GAS RATION SPECIAL

Go to market, beach or visit friends on one of these babies and forget your gas worries. You can cover 100 miles or better on one gallon of precious fuel.

by Howard G. McEntee

WITH gasoline and oil getting scarcer all the time, it behooves those of us who are able, to arrange our transportation in such a manner that a little of these commodities will go a long way. A small motor scooter is one of the most economical forms of powered transportation. Unfortunately the supply of these vehicles is limited, with new ones unobtainable, and used ones scarce and prohibitively priced. The answer seems to be "build your own."

The scooter to be described was evolved after the writer secured a second hand engine in fair shape. This was carefully reconditioned, and worn parts replaced, whereupon it was found to be very reliable in operation. This engine is a Lauson RSC, rated at 1.5 H.P., but any engine of from 3/4 to 2 H.P. or so is satisfactory, as they are all of about the same size and general arrangement. The prospective builder will probably be unable to secure a new engine, but the second hand field is very large. An advertisement in the local newspaper will usually bring results.

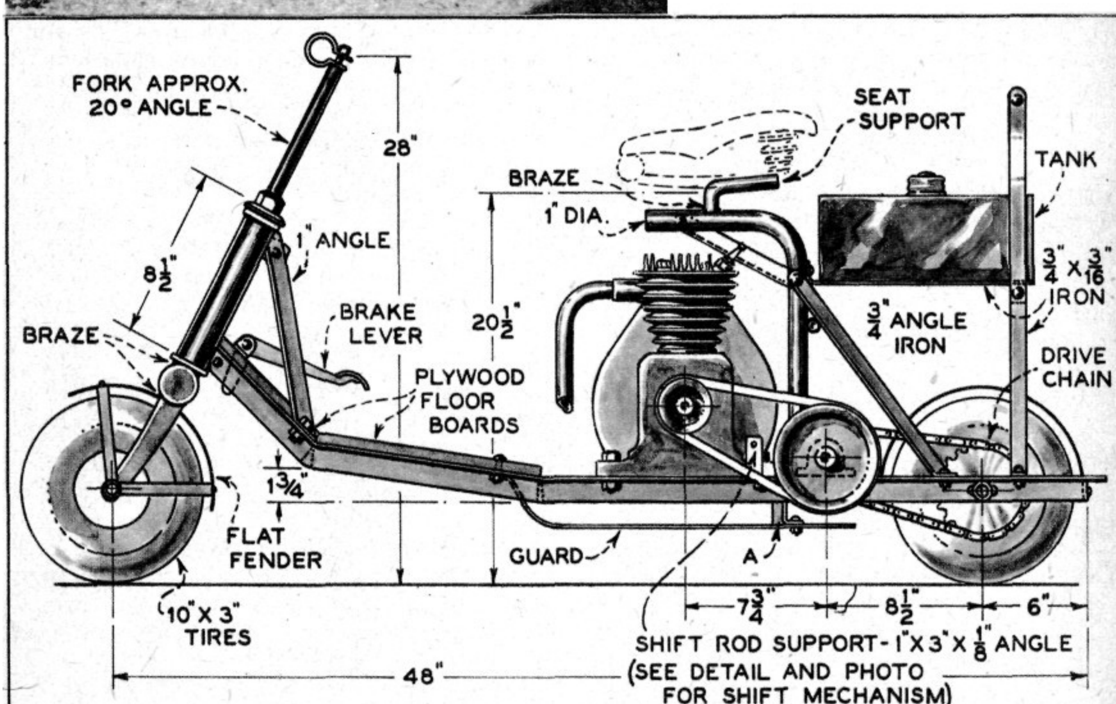
Only general dimensions will be given as a building guide, since the construction will

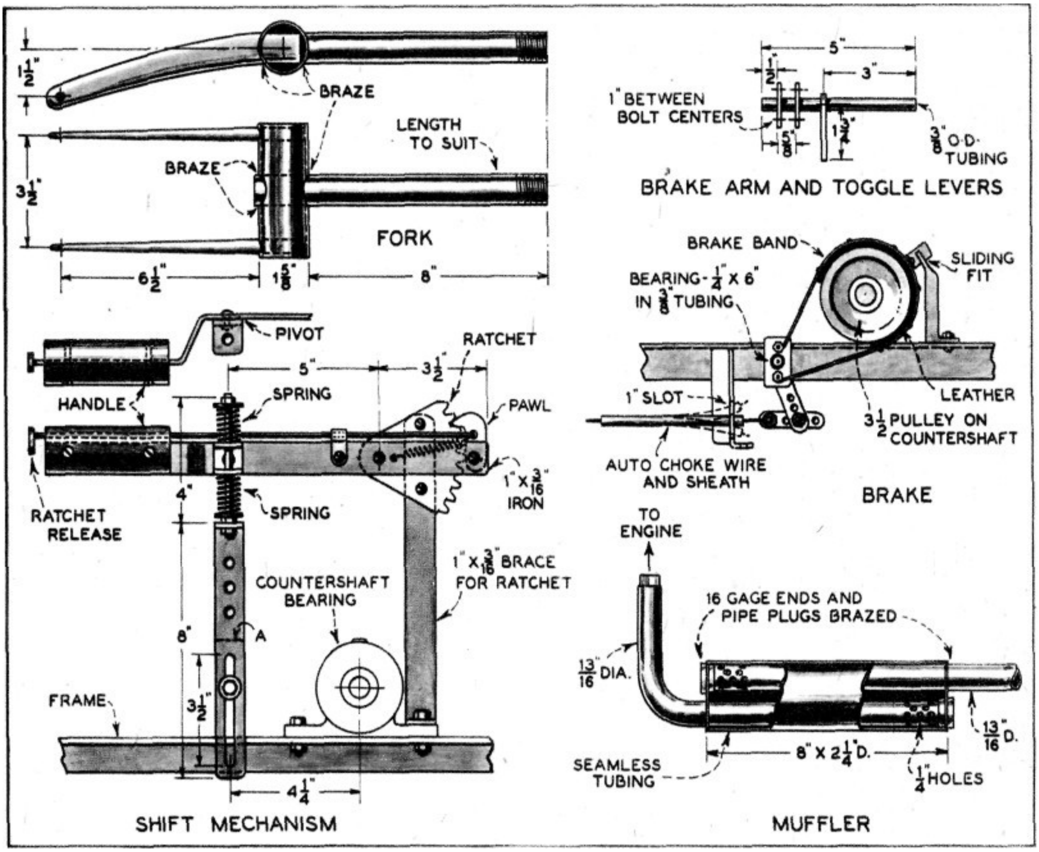
naturally be governed largely by what parts the builder can gather together, as was the case here.

Construction starts, of course, with the frame, which is made of 1-1/8"x3/16" soft angle iron. Beds are a fine source of this material. First the side pieces are cut to length; then with a hacksaw, slots are cut at points A and B (see drawing) on the vertical side, up to but not through the horizontal side, or, in other words, to the apex of the angle.

The pieces may then be bent easily in a vise. After each side member is bent at the two points, and the three cross pieces are cut to size, together with the center motor support piece, they are about ready for welding. First, however, six slots should be cut. four for mounting the engine and two for the rear axle. Those for the engine must be positioned

Left: Completed scooter with lights, horn and rear vision mirror. Some states require twin headlights and tail light for these vehicles. Check with your Motor Vehicle Bureau. Below: Side view shows principal construction points. Motor is at right angles to chassis.





Parts details. Most materials can be obtained from junk. Frame is made from old bed rails.

according to the particular unit to be used, but should be measured so that the motor pulley comes at about the point shown. The welding can be handled by any well equipped auto repair shop.

After these initial welds are made, the side members must be cut once more at points C so that they may be bent inward at the front.

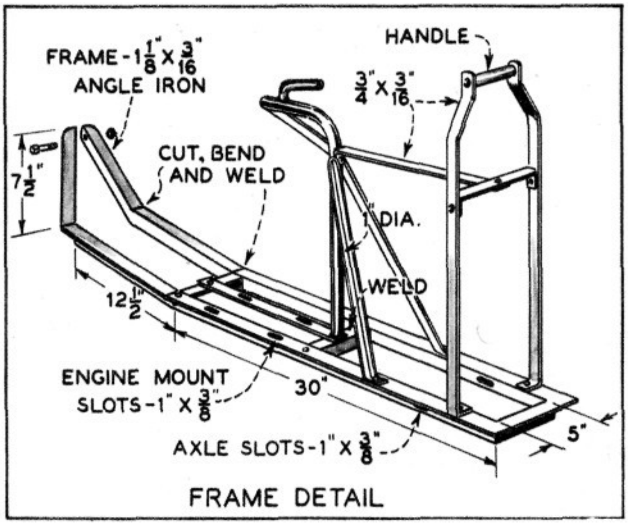
The bearing for the front wheel fork on this scooter is a cast iron piece about 7-1/2" tall and with a tubular stub at top and bottom. It was made for heavy commercial delivery bicycle use. but a bearing tube from an ordinary adult bike will do very well. This piece is held between the upward and inward bent front ends of the frame with a single bolt. The bracing pieces running from points C on the frame up to the top of the bearing tube are of 1"x1/8" angle iron bolted at top and bottom and also welded at the latter point. The tube should slant to the rear at an angle of about 20 degrees.

At points A on the frame a 5/16" bolt is run from side to side with a spacer of small diameter gas pipe between the side members.

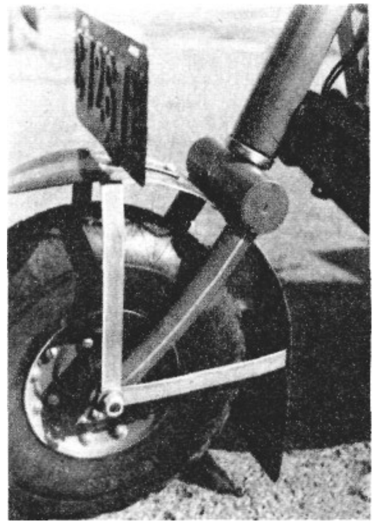
The front fork will have to be built up as there is no bicycle part of the correct size. The lower ends, or prongs, of the fork are cut from an old bike frame and are brazed to a piece of 1-5/8" diameter tubing which is 5" long. The prong pieces should be fitted through oblong holes cut in the lower side of the tubing and curved to butt snugly against the inside of the upper portion. The stem of the fork is also cut from a bicycle so as to make available the threaded upper end. This piece is brazed into the 1-5/8" tubing which is first bored or filed out for a snug fit. The bearings and cones from a bicycle fork assembly, together with the nuts and washer that hold them in place, complete this part of the machine.

The neck is much longer than those used on bicycles and must be built up from one of the latter plus a piece of tubing that will fit inside the stem of the fork. The same tightening arrangement as used in standard bike practice is satisfactory. Bicycle handlebars and lubber grips are used.

The seat is mounted over the motor and is held on a cut-down bike seat post brazed to



Here is bare frame with seat support and engine mount shown. Cut slots for hold-down bolts to fit your particular motor.

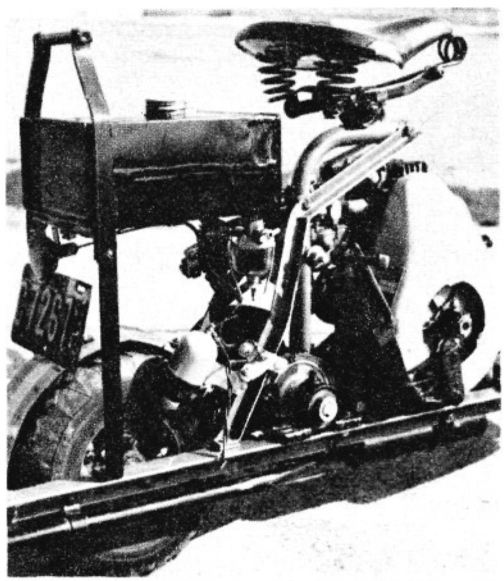


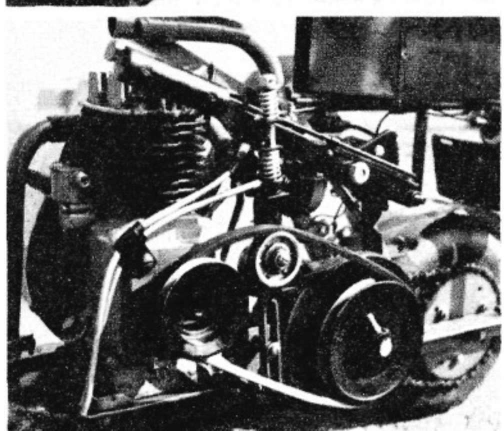
Closeup of sturdy front fork construction. Licenses are required by some states

a curved piece of 1" diameter tubing. This tubing is braced by two pieces of 3/4"x1/8" angle iron which run back to the main frame. The seat itself is of a large, well sprung type that makes for comfortable riding. All joints of the seat support are brazed and the whole tripod may be removed from the frame by taking out three bolts.

We come now to the power and drive mechanism, where lie most of the procurement and construction headaches. The wheels are heavy duty type with ball bearings, carrying husky 4 ply tires of 10x3 size. The rear tire *must* be of the so-called "lug base" style, meaning that the tire has moulded ridges running crosswise around the inner circumference, which fit into slots pressed in the steel wheels. These ridges or lugs prevent the tire from slipping around the wheel under power. Do not try to use a smooth-type tire as it is wasted time, a fact ascertained by sad experience. Either style of tire, however, may be used on the front wheel. These tires are usually of single tube construction with no inner tube.

Wheels for these small tires are usually made in three pieces, consisting of a hub carrying the ball bearings, and two pressed steel discs to fit in the tire, the three sections held together by *[Continued on page* 132]





Above: Gas tank feeds motor by gravity. Dome shaped gadget near wheel is generator. Right: Clutching arrangement is operated by idler pulley (center) which raises and lowers to engage or disengage driver pulleys. Wheel itself (with sprocket) is in turn driven by chain from sprocket on pulley shaft,

Gas Ration Special

[*Continued from page* 93]

bolts. The rear axle is simply a 7" length of 3/8" diameter rod threaded at both ends and fitting snugly through the center of the bearing on each end of the hub. Spacers between the outside of the bearing and the frame sides position the wheel securely.

The sprocket on the rear wheel is an 18 tooth unit of the disc type, held in place oh the wheel by three 3/16" bolts and pipe spacers. The sprocket is held out from the wheel far enough so that it clears the tire by about 3/8", and must be adjusted to rotate absolutely true, with no radial or side wobble. The long bolts are inserted in place of three of the short ones that hold the wheel parts together. Although the sprocket shown is a special unit, most bicycle dealers can supply one with the proper number of teeth, and which can be drilled for the three bolts.

The chain is standard bicycle variety of 1" pitch and 3/16" width, and the two sprockets must, of course, be of similar description. The chain is about 30" in length. While on the subject, it might be said that while the chain mentioned has proved quite satisfactory and will give good service if cleaned and oiled occasionally, a much tetter drive may be had from the s»-called No. 41 N chain. This is 1/2" pitch and 3/16" wide and is used on many racing bicycles as it is more suited to high speed work. The sprockets must be of the same type.

It is quite possible to use V-belt drive from the counter-shaft to the rear wheel. If this is done the wheel pulley should be about 5-1/2" dia meter with a 3" countershaft pulley, the idea being to get a 2-1 ratio between the two.

The countershaft sprocket is a 9-tooth size, also a standard bike part, with an added steel hub. The shaft is 5/8" diameter and is carried in a self-aligning ball bearing pillow block at each end. Ordinary bronze-bushed bearings are quite usable, but must be oiled more often. The sprocket hub should be pinned to the countershaft with a taper pin or plain 1/8" diameter rod. Set-screws .simply will not hold here for any length of time unless used with a keyway of some sort. After trying vainlv to make the sprocket stay put, it was finally pinned, keyed and held by two set screws, and has not budged since being so fastened.

The countershaft is cut flush with the bearing on the right end but projects 2-1/4" beyond the left bearing. On this end are fastened two 5-1/2" diameter pulleys.

The motor pulley is the type with 1-3/4", 2-1/4" 2-3/4", and 3-1/4" steps, only the first and third of -which are utilized. The "gear shift" is very simple but highly satisfactory. The two V-belts are left in place at all times but are too loose to provide any power transfer from motor to countershaft. When the shift lever is pushed downward, a pulley is lowered onto the top of the inner belt, tightening it so that the countershaft is driven. For high "gear" the lever is then raised upwards past the center position where both belts are loose, until another idler pulley is forced up against the underside of the other belt, which tightens it and again drives the counter shaft, but at a higher speed.

The two idler pulleys are of ball bearing construction, and each is held to the shift rod by a single 1/4" diameter bolt. Roller skate wheels are good for this use; if flanged pulleys are obtained they must have a width inside the flanges of at least 1/2". Plain bearing types are not advisable here as the pulleys turn at high speed and are under considerable load.

Some means must be provided to hold the shift arrangement in the desired position, whether up or down. An auto brake lever ratchet and pawl have been adapted for this use, and while the make is unknown, the builder can probably find something satisfactory at his local supply store or "junkie."

Most of these ratchets are designed to hold in only one direction and slip the other way, so the teeth must be filed to such a shape that they will hold in either direction. The pieces are usually case-hardened but can be softened for drilling and filing by bringing them to a red heat for a few minutes, then allowing them to cool slowly.

The ratchet piece was drilled large enough to fit over the bearing of the shift lever and is braced by a piece of 1"x3/16" steel running down to the frame. The bearing is a piece of brass tubing 5/8" in diameter with 1/32" wall thickness, inside which is the shaft itself, a length of 1/2" diameter rod, turned down to 3/8" at each end and threaded. The tubing is brazed to the angle iron seat braces.

The shift lever is bolted onto its shaft with the pawl on the overhanging rear and actuated by a 3/16" rod run forward through the wooden handle. A spring keeps the pawl tightly against the ratchet except when the push rod button is depressed.

The shift rod which carries the two idlers is held to the lever by a single 1/4" diameter bolt and another bolt of the same size keeps the lower end of the rod in place. The slot is 3-1/2" long which allows the rod a vertical movement of about the same distance. Both of the bolts are provided with bronze bushings to reduce wear. The rod must be held out about 7/8" from the frame so that one idler can be placed on each side. The holes for the idler pulley boits should not be drilled until the motor and countershaft are mounted and the pulley and belts put temporarily in place to be sure the idlers will be in the proper location.

A spring coupling is provided between the lever and rod as may be seen in the illustration. The rod is bent out at right angles at the top and an

[*Continued on page* 142]

Gas Ration Special

[*Continued from page* 132]

extension made from a 3/8" diameter bicycle rear wheel shaft bolted on. This slides through two holes in a U-shaped metal piece, with a spring at top and bottom. A bolt over the upper end keeps the whole assembly in place and is turned tight enough to place the springs under considerable pressure. Such a device prevents overstretching the belts and makes the drive smoother.

This completes the heavy construction work, but many other details remain. The floor boards are of 9/16" plywood held on with bolts. On one side a cut-down bike kick-stand is fastened, bolted both to the floor and the frame for strength.

The motor is fitted with a simple muffler and a long tail pipe and is surprisingly quiet in operation. Construction details are shown on the drawings. The muffler body tubing and the exhaust pipe ends are closed with discs of 1/16" steel sheet brazed in place. The small tubing has about 20-1/4" dia. holes in each piece which appear to be ample.

A guard piece of 3/4" x 1/8" strap iron, bent upward at the front and bolted to the floor board, runs rearward about on the centerline of the frame. The rear end is supported by the angle piece which guides the after end of the brake cable. This guard projects about 1" lower than the muffler and protects the brake mechanism, and the countershaft pulleys as well, when the machine is being lifted over curbs and other obstacles.

"It has no practical value, but it works!"

The sheet metal gas tank is fastened to the seat support in front and the vear is held up on a frame of 3/4"x1/8" strap iron. This frame is extended over the tank to form a handle that is very convenient when lifting the vehicle.

Front and rear fenders are bent from No. 20 gauge sheet steel; the one in front is braced by strips of 16 gauge sheet riveted in place. Both fenders are the flat crownless type,—all that can be made without extensive sheet metal working equipment.

The brake is external contracting and works on an ordinary 3-1/2" V-pulley keyed to the countershaft. The brake band, cut from 20 gauge steel, has a lining of heavy leather. A simple toggle arrangement tightens the band around the V-belt and is actuated by a foot pedal on the floor board. The two are connected by a piece of auto choke wire.

The carburetor controls of choke and throttle are on the handlebars, operated by bicycle-type flexible wire cables.

Some States (such as New Jersey) require two headlights and a tail light before a license will be granted. The lights used here are all bicycle products operated by a small bike generator driven by the rear tire. As this does not produce quite high enough voltage, the generator is now being belt driven from the countershaft.

A great deal of experimentation has been done to ascertain the proper drive ratios. Although the photos show different size pulleys on the countershaft (they were 5" diameter for "high" and 6-1/2" for "low") these have been replaced by two of 5-1/2" dia., which seems about right for the motor used. The ratio from motor to rear wheel (using pitch diameters of the pulleys which average 1/4" less than outside diameter) and including the 2 to 1 afforded by the chain drive is thus about 4.2 to 1 for high and 7 to 1 for low. This provides a top speed of about 25 m.p.h. in high and makes for easy starting and plenty of power for hill climbing in low. Using the pulleys shown in the photos, the ratios were 3.8 to 1 and 8.3 to 1 respectively, but these were thought to be a bit too far each way for best results. All the belts and pulleys are ordinary 1/2" wide home workshop equipment.

A simple device was developed to prevent the V-belts from pulling when the shift is in neutral, a natural tendency even though they are quite loose. An angle bracket is mounted on the motor crankcase, the end projecting outwards just in front of and below the motor pulley. To this are bolted two strips of brass 1/8"x5/8"x2" long, bent so they just clear each belt when it is tightened to the running position. They prevent the belts from wrapping around the pulley when loose.

Persons under 19 years of age comprise 45% of the Soviet Union's population, compared with 32% in Great Britain, 30% in France.

Because eating spoiled food may cause animals to become ill, home economists advise burying any spoiled canned food with a tablespoonful of lye to each quart.