Rounding the turn in his latest racer, Wayne Ison improves his lead, and slams into the stretch going away.

Latest Ison Racing Kart

DESIGNED strictly as an all-out racing machine, this "roadster" style kart is suitable for A, B, or C class racing. It boasts such features as live axle rear end, racing brakes, and light overall weight with forward weight distribution for high performance in competition.

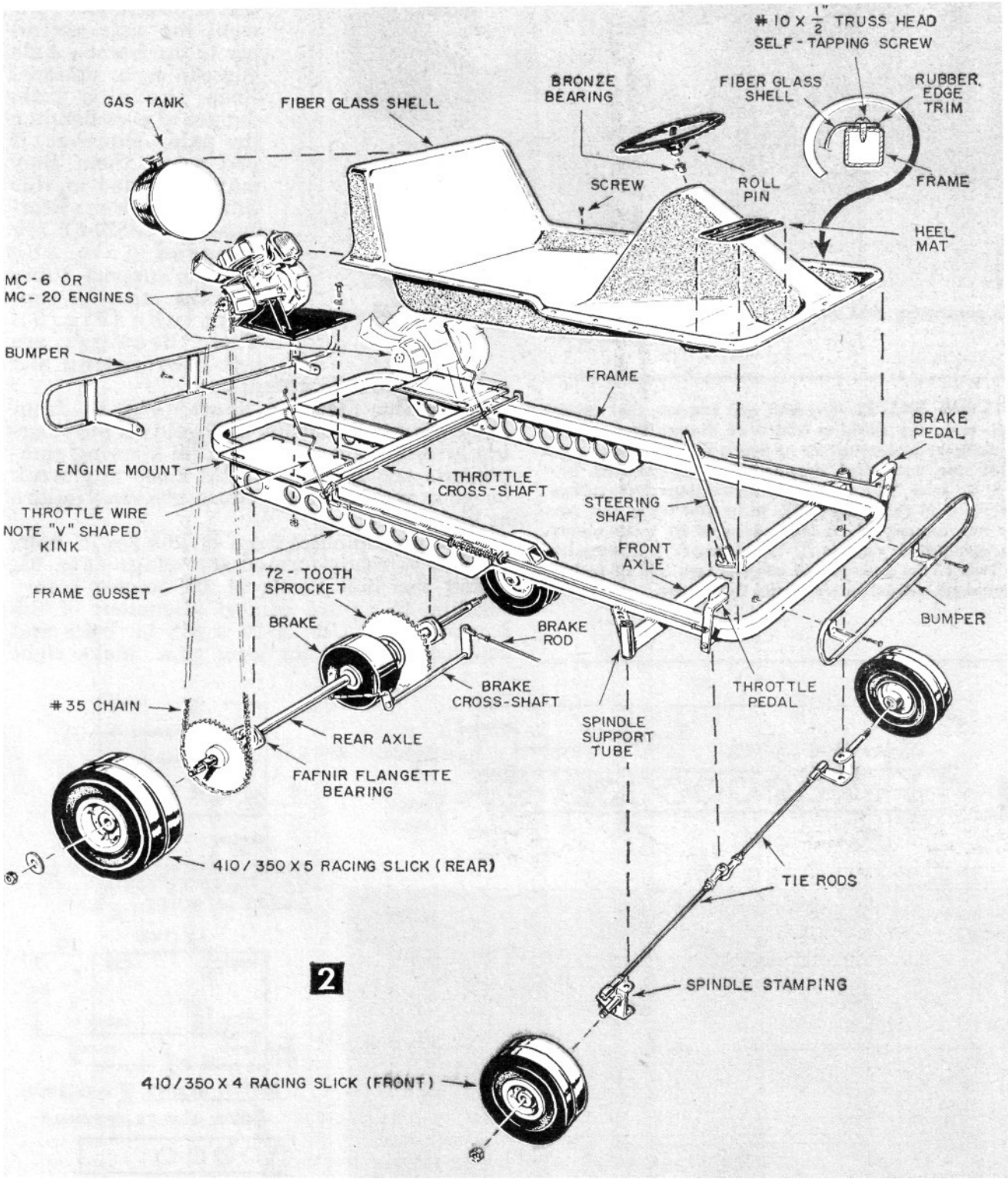
Get there first! **— that's the idea in a race. And when you jam the foot-feed down in this four-wheeled bomb you get that solid feel in the middle of your back that tells you those two hot MC-6 engines are pumping the road out behind—but fast!**

PHOTOS BY WAYNE BRYANT

Craft Print Project No. 318

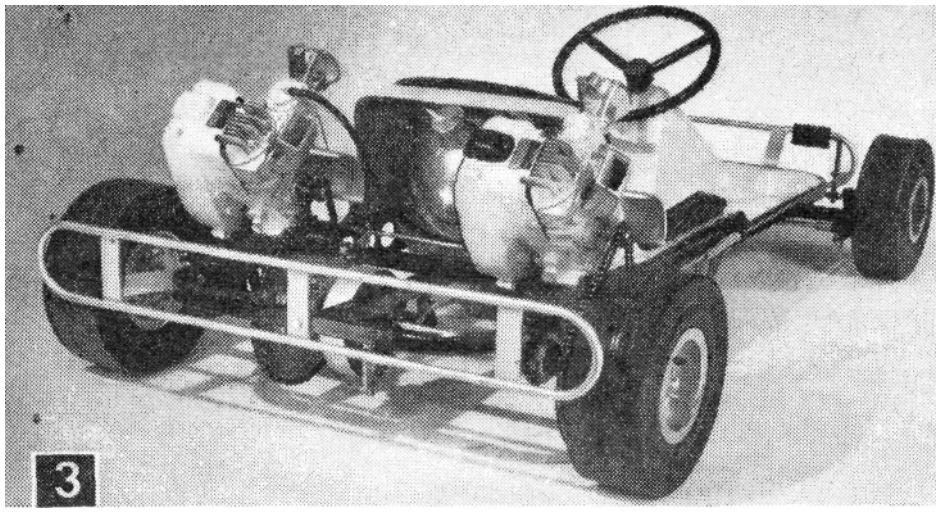
Start Construction with the frame, making it of two "U" shaped bends of 1 in. sq. 16 ga. tubing. These may be purchased already bent or you can make a number of saw slots on the inside of the bends and weld them shut after the bends have been formed. After welding the overlap of the two frame ends (Figs. 5 and 7), weld in the frame cross members.

Cut the frame gussets (Fig. 4) from 1/8 in. HRS (hot rolled steel). Use hole saws to cut out the required holes. Weld the gussets to the frame, with spaced welds, using 1/4 in. overlap. Be sure to weld the gusset with the 11/16 in. dia. hole to the left side of the frame. Line up the brake mounting bracket when welding it to the frame by bolting all three *Fafnir* bearings to their mounts and sliding the axle or a length of 1 in. shaft through them. Then clamp the brake mounting bracket to the cross member and weld. Cut the engine mounts (Fig. 4) to size from3/16in. HRS. Slot them by drilling a row of 3/8 in. dia. holes and filing the slots out with a rat-tail file. Weld them to the frame as shown in Fig. 5. Make the two throttle shaft brackets



and two guide brackets (Fig. 4). Cut the heads from two 3/8-24 x 2-1/2-in. bolts for pedal mounting studs and weld all these parts to the frame.

The Front Axle is made from the same square tubing as the frame. Cut it to length and file the ends out with a half-round file to fit the spindle support tubes at the correct angle (Figs. 6 and 7). Check this fit as you file to make sure the tube will tilt inward at 10° and backward at 10°. Although commercial tubing of the correct size for the spindle support tubes is made, it may be easier to have a machine shop bore a length of 1-in. dia. shaft for this part. Be sure to check the angles again when welding these tubes to the axle ends. Make the steering support tube out of 1/2 in. black iron pipe and weld it



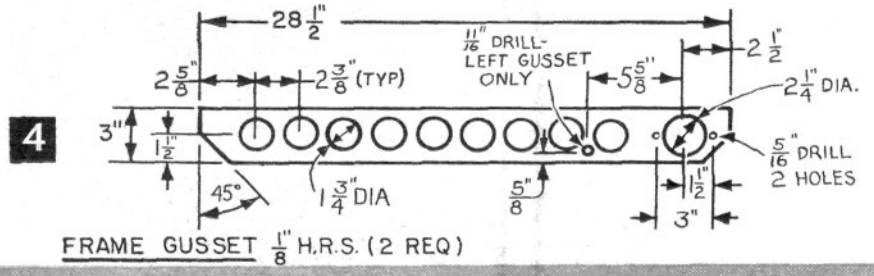
This quartering shot shows the business end of the new racer. Plenty of power there, and plenty of go!

EDITOR'S NOTE: Herewith we present the newest design from the drafting board of Wayne Ison, racing kart designer-builder-driver of South Bend, Indiana, who created the successful dropped-shell competition kart (S & M June '60) and the outstanding micro-midget racer (S & M Feb., Apr. '59). In its first trials, this new racer has already given indications of its track ability. With twin MC-6 engines its performance is impressive. With two of the new MC-20 engines (see end of article) it should be a track-eater of the first order.

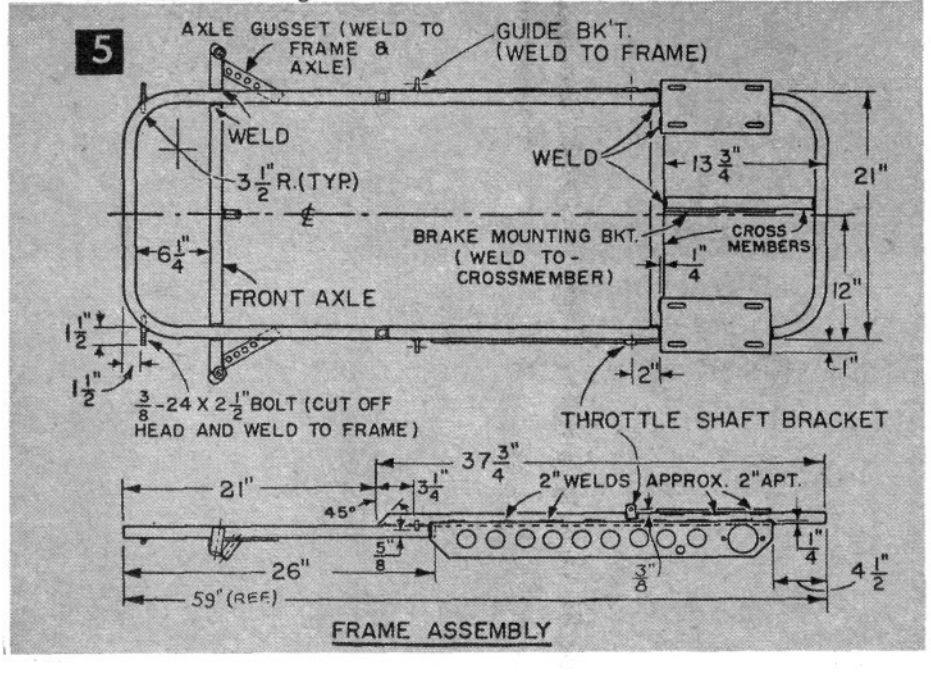
(securely) to the center of the axle. Now weld the axle assembly to the frame. Axle gussets are optional since there is little danger of ever bending the axle. However, if you want them they may be added at this time. *Bost-Bronz* bearings (#FB-810-6) are pressed into the spindle support tubes and the steering support tube (Fig. 6). These bearings are self-lubricating and will require little attention.

Make the Steering Shaft (Fig. 6) from 1/2 in. dia. steel shafting and weld on the steering arm. Be sure welds on all steering components are good and solid since any weak or poor welding may cause steering failure at high speeds.

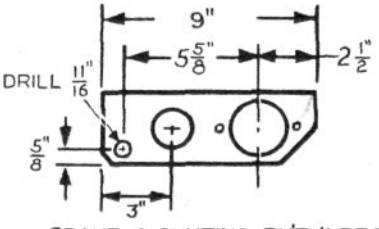
Make the spindles from5/8-18x3-1/2in. bolts welded to ready-formed stampings (Fig. 6). Grind the bolt heads at 10° angles before welding to assure correct alignment of the front-wheels. Use 1/2-20 x 3-1/2 in. bolts and self locking nuts for king pins. Make right



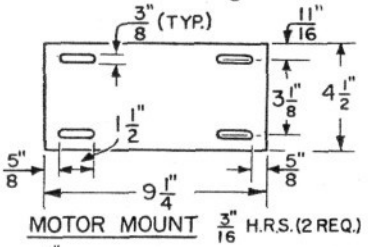
FRAME GUSSET 1/8" H.R.S. (2 REQ)



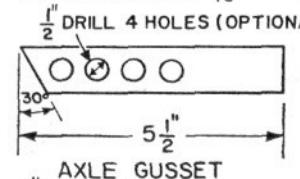
FRAME ASSEMBLY



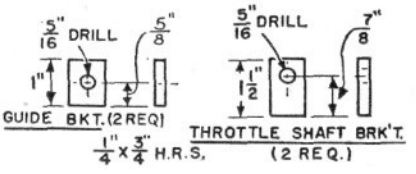
BRAKE MOUNTING BK'T. (1 REQ)
NOTE: SAME AS FRAME GUSSET EXCEPT AS NOTED— 1/8" H.R.S.



MOTOR MOUNT 3/16" H.R.S. (2 REQ.)

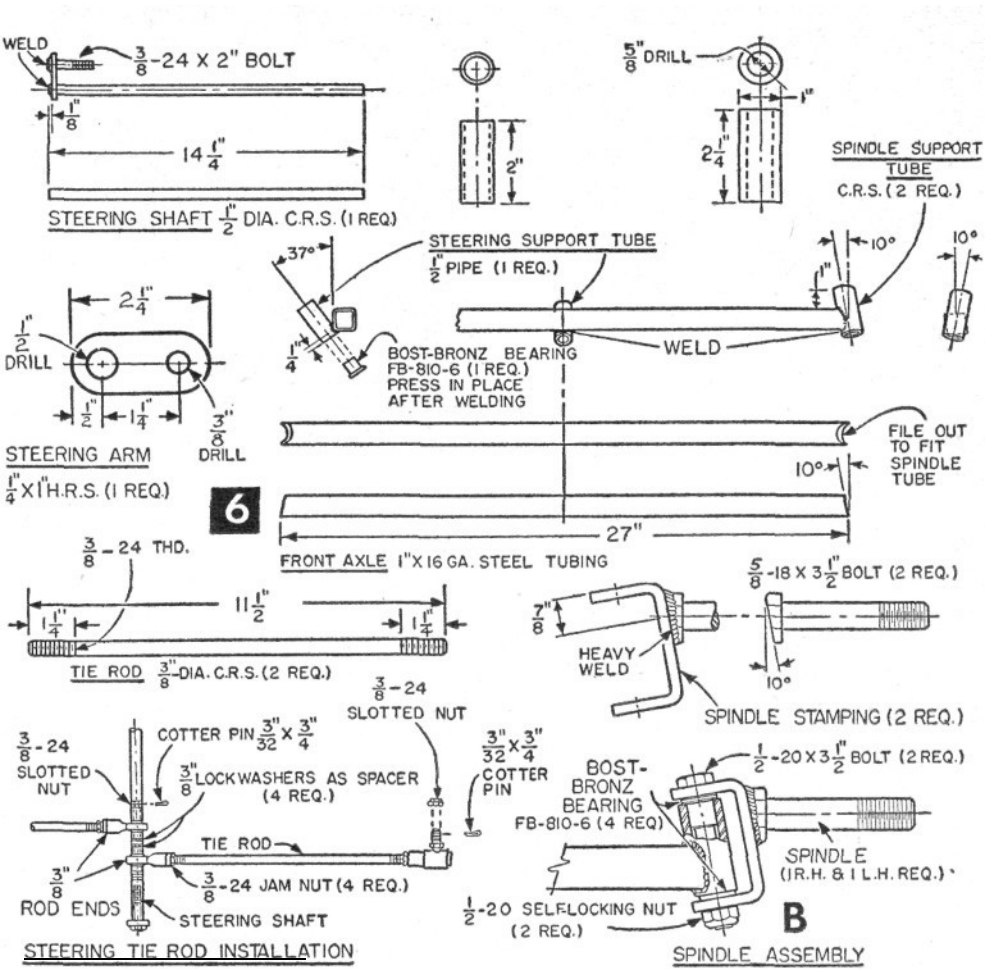


AXLE GUSSET
1/8" X 1" H.R.S. (2 REQ.)



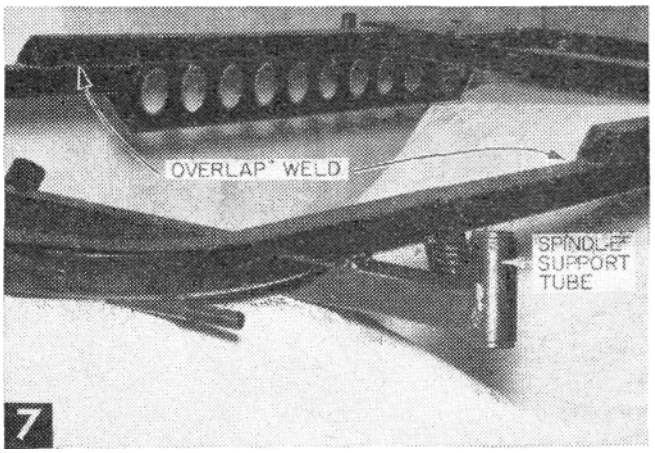
and left control pedals (Fig. 12) and install them on the mounting studs between two 3/8-24in. self locking nuts.

Cut tie rods from 3/8 in. dia. CRS (cold rolled steel) and thread for rod ends (Fig. 6). Use two3/8in. aircraft type spherical rod ends at the center and two3/8in. kart ball joints on the outside ends. To install the tie rods on the steering shaft, first slide on two 3/8 in. lock washers to act as spacers, then one of the tie rods, next two more lock washers, and last the other tie rod, secured with a3/8-24in. slotted nut. To meet current GCKA rules, all rod ends must be lock-wired or cotter keyed, so drill the end of the 3/8 in. bolt and insert a 3/32 x3/4in. cotter pin. But before installing the cotter pins, check front wheel toe-in by placing the front wheels on the spindles and adjusting rod ends to give1/16in. toe-in. It will be easier to do this now than after the body shell is installed. Once the correct position has been found, lock the rod ends with jam nuts and the tie rods may be removed for painting.

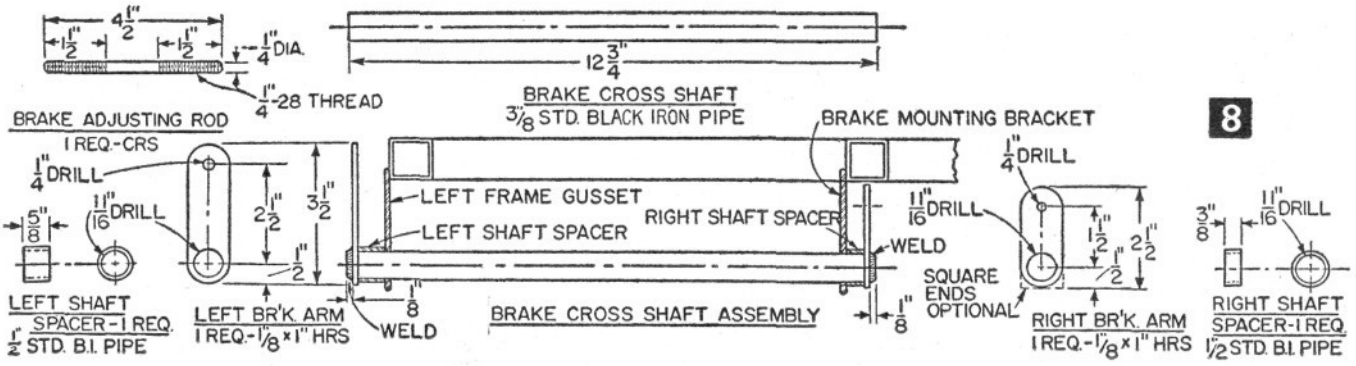


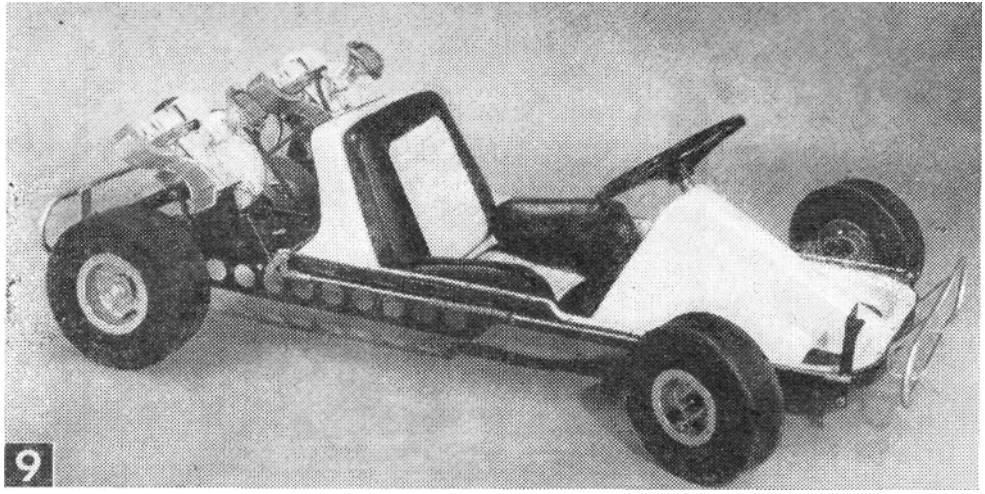
Fabricate Brake Cross Shaft components next, (Fig. 8). Weld the right brake arm to the shaft, slide on the right shaft-spacer, and insert the cross shaft through the frame. Next, slip on the left shaft-spacer and left brake-arm, check alignment and weld.

Cut brake and throttle control rods from 1/4 in. CRS (Fig. 11). Thread the ends of the rods and slide them through the guide brackets. Slide1/4in. flat washers on the front



Simple design and rugged construction are evident in this close-up of the frame. Note angle of spindle support tubes.





Here's how your kart will look when completed—all that's needed now is you aboard and a clear track.

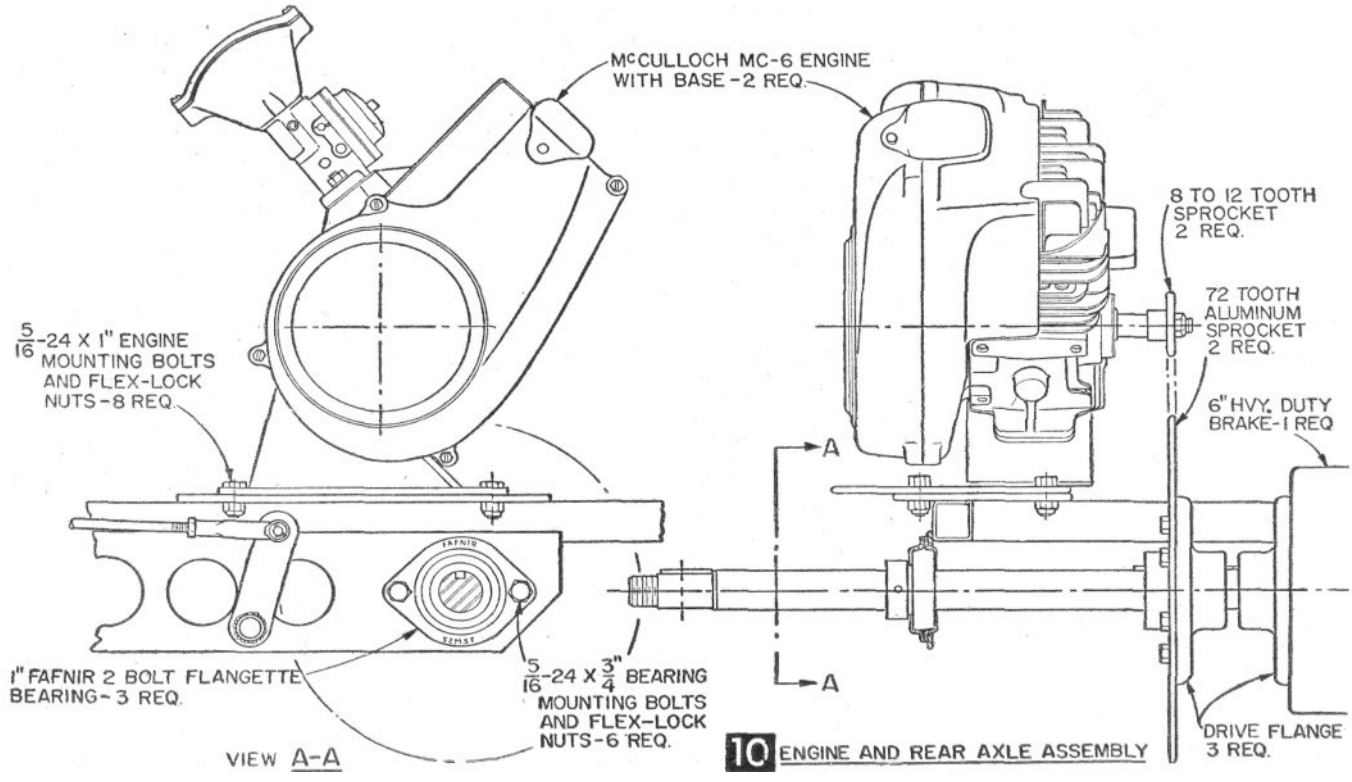
painted. Remove all scale and weld splatter with a small cold chisel and a wire brush. Clean off all grease and oil with metal cleaner (available from paint stores), then give the frame one coat of metal primer and one coat of automobile enamel. For a real sharp dress up job have the control rods, pedals, tie rods, and bumpers chrome plated.

ends and return springs on the rear ends of each rod. Slip the throttle stop on the right one only, then another 1/4 in. flat washer on each rod. Thread on 1/4 in. ball joints and attach them to the pedals. Slide the 5/26 in. throttle cross shaft through its brackets and clamp on one of the throttle arms. Next, thread a clevis on the rear of each control rod and attach to the throttle arms and brake arms. With control pedals in the back position, drill a 3/32 in. hole in front of the 1/4 in. flat washers on the front end of each rod. Slide the springs back out of the way and drill another 3/32 in. hole 6 in. back on the brake rod, and 6-3/8 in. back on the throttle rod. Slide the springs forward and compress to install cotter pins.

The Frame may now be disassembled and

If you have no machine facilities, purchase or have the rear axle machined per Figs. 10A and 10B. Steel may be used in place of aluminum but will add 5 lbs. to axle weight.

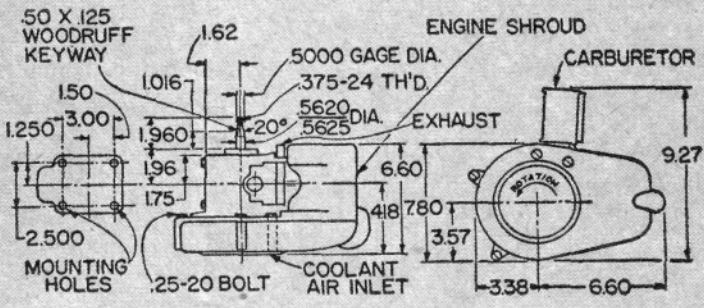
Reassemble the frame as before. Assemble the rear axle by sliding the center bearing on the axle first, then the brake unit and left hand sprocket with drive hub. Insert the left axle end through the left bearing hole and slide the right axle end through the center bearing hole. Place the left *Fafnir* bearing and the center bearing on the axle and loosely bolt them to the frame. Next, push the axle through the frame to the right and slide on the right side bearing. When the axle is correctly centered, tighten all three bearings and lock the retaining collars. Install the right side drive sprockets and all keys at this point,

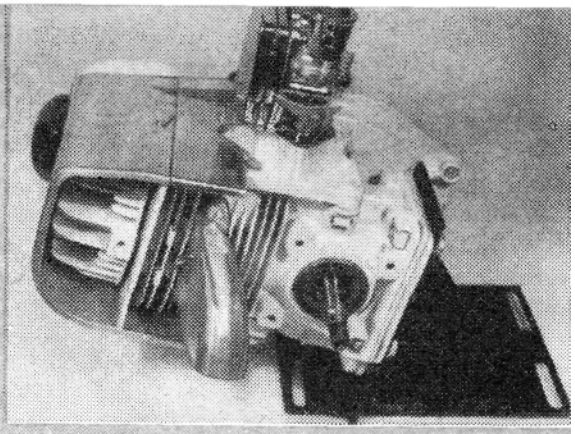


10 ENGINE AND REAR AXLE ASSEMBLY

NEWS for karters

Specs on The MC-20 McCulloch Engine





McCulloch's new MC-20, most powerful kart engine per cubic inch in America.

With more horsepower per cubic inch than any other kart engine in America, the brand new McCulloch MC-20 engine promises to add to the string of victories and records racked up by its predecessors, the MC-5, MC-6, and MC-10 engines, according to the manufacturer, McCulloch Corporation of Los Angeles. This new engine is fairly bulging with improvements: die-cast, deep finned, thicker walled aluminum alloy cylinder with added fin—"optimum timing" ignition with high pressure magneto flywheel and moisture-proof coil—multi-speed, full bore carburetion and new power-head design—controlled air-turbulence created by new shroud (it's chrome plated), —and even a polished carburetor!

Engine Specifications

Weight of Unit	10 lbs.
Type of Engine	Single cyl., two stroke air-cooled, crankcase, scavenged.
Bore	2.156
Stroke	1.635
Displacement	5.8 cu. in. or 95 c.c.
Compression Ratio to 1	9:1
Maximum Free RPM	12,000-15,000 (approximate)
Direction of Rotation	Counter Clockwise (facing flywheel)
Carburetor Type	Special new McCulloch diaphragm type with low air-flow restriction, ¾-in. venturi.
Type Fuel Recommended	Automotive regular grade
Connecting Rod Crankpin Bearings	24 Loose Needle Rollers
Connecting Rod Wrist Pin Bearing	Needle Bearings
Main Bearings	Ball Bearings each end

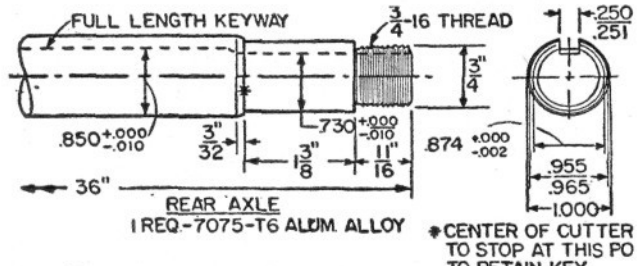
but do not tighten up the set screws until the sprockets can be aligned with the engine drive sprockets.

Hook-up the brake adjusting rod to the cross shaft and brake lever. The quick adjusting rod end will permit you to adjust brake clearance instantly without removing clevis pins or other parts.

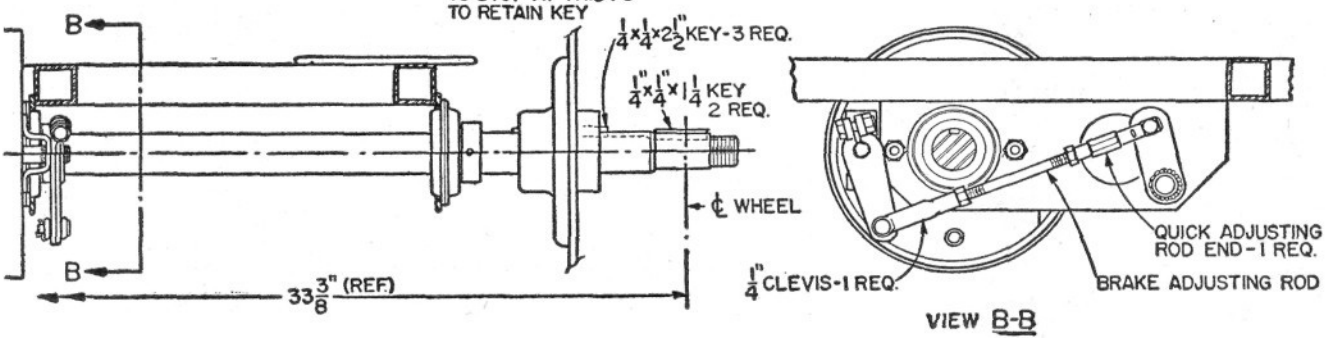
Install the wheels and secure the front ones with % in. self locking nuts, the rear ones with 3/4 in. thin self locking nuts.

Bolt The Engines loosely to their mounts and install the chain. Move the engines forward to adjust chain tension, and tighten the engine bolts.

To hook up the throttle linkage, slide one arm on the throttle cross-shaft for each engine (Fig. 13). Line up the arm with the carburetor linkage. Bend the connecting wire from1/16in. dia. gas welding rod. It is easy to form and its copper coating will prevent rusting. About half way down the wire bend a "V" shaped kink (Fig. 2) to act as a spring when the wire is under load. Insert a clamp-up bushing in each throttle arm and slide the



NEXT MONTH—a Kart engine expert reveals professional secrets of hopping up—get more GO from your engine with this information-packed article.



bottom end of the wire through, slipping the top end through the carburetor arm. With both carburetor arms against the idle screws and the foot pedal against its rear stop, tighten the clamp-up bushing screws against the throttle wires. When properly adjusted both throttles will open at the same time and will be in the full open position just before the foot pedal reaches its full forward position. The 4-7/8in. dimension on the throttle stop may have to be reduced if the throttles do not open fully.

If you intend to use bumpers on your kart, make and install them at this time (Fig. 12). Place bumpers in position on the frame and mark bolt hole positions, then drill5/16in. dia. holes through the frame and bolt the bumpers in place. Your chassis is now complete and is ready for the body shell.

The Rugged Fiberglass Body shell serves as seat and floor pan, seat back and steering shaft support and will weigh only about 10 lbs. Sand the edges of the shell to remove all sharp projections and wash it in warm water and soap to remove the release agent film. For a higher gloss finish on the body, rub the surface with rubbing compound, obtainable at automobile body and paint shops. Use lots of pressure for a glass-like gloss. Do not rub the areas to be covered with upholstery or the foot wells at the front of the shell. Cut two heel mats (Fig. 2) from corrugated floor mat material and cement them to the bottoms of the foot wells. Finish off the shell with several coats of wax.

Unless you have the facilities and the experience to upholster your own kart, it will be cheaper and more satisfactory to have it done by someone in this business. Many automobile seat cover shops now offer kart upholstery service.

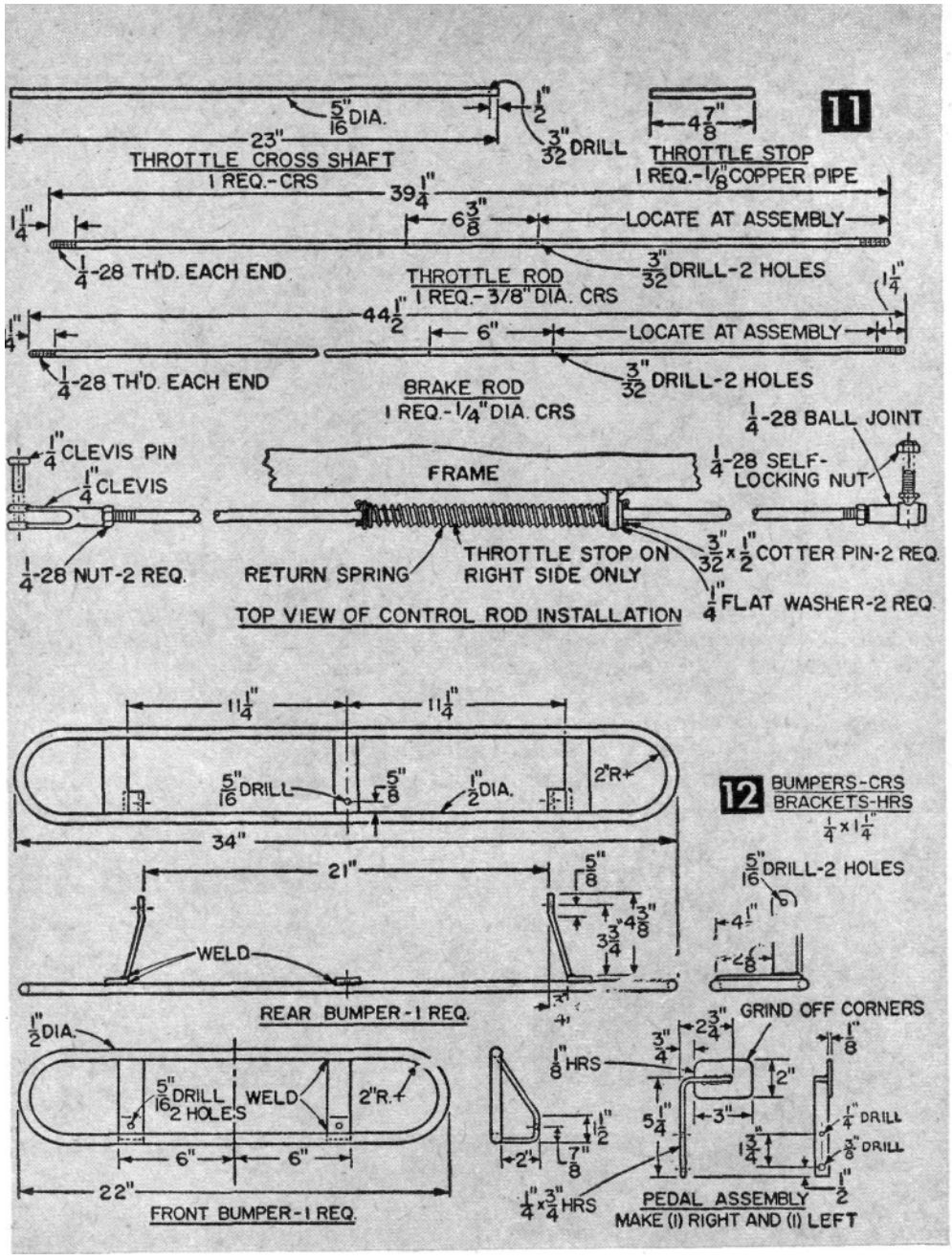
MATERIALS LIST—ISON RACING KART

Frame and Bumpers

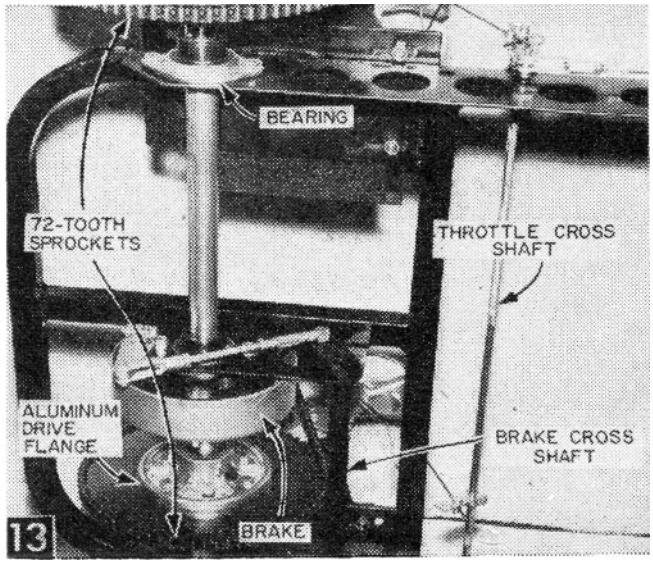
No. Req.	Size and Description	Use
1	16 ga. x 1″ sq x 74″ steel tubing	front V-bend
1	16 ga. x 1″ sq. x 98″ steel tubing	rear V-bend
1	16 ga. x 1″ sq. x 33″ steel tubing	cross members
1	16 ga. x 1″ sq. x 27″ steel tubing	front axle
1	1/8 x 3 x 72″ HR steel	gussets, brackets
1	1/4 x 3/4 x 6″ HR steel	brackets
2	3/16 x 4 1/2 x 9 1/4″ HR steel	motor mounts
2	1″ O.D. x 5/8″ I.D. x 2 1/4″ CR steel tubing	spindle tubes
1	1/2 x 2″ std. black iron pipe	steering tube
2	3/8-24 x 2 1/2″ bolts, with regular and self-locking nuts	pedal studs
11 ft.	1/2″ dia. CR steel	bumpers
40 in.	1/4″ x 1 1/4″ HR steel	bumper mounts
5	5/16-24 x 1 3/4″ hex head cap screws with self-locking nuts	bumper mounts
	Spindles, Wheels, and Steering	
2	spindle stampings	spindles
2	5/8-18 x 3 1/2″ hex-head cap screws with self-locking nuts	spindles
2	1/2-20 x 3 1/2″ hex-head cap screws with self-locking nuts	king bolts
6	*Bost-Bronz* bearings #FB-810-6	spindle and steering shaft bearings
2	4″ aluminum Wheel Ass'y's with 410/350X4 slick tires and tubes	
2	5″ aluminum Wheel Ass'y's with 410/350X5 slick tires and tubes	
1	1/2″ dia. x 14 1/2″ CR steel	steering shaft
1	1/4 x 1x 2 1/4″ HR steel	steering arm
1	3/8-24 x 2″ hex-head cap screws with 3 slotted nuts and cotters	steering arm
1	12″ steering wheel	steering
1	3/16 x 1″ roll pin	steering wheel
2	3/8″ dia. x 11 1/2″ CR steel	tie rods
2	3/8″ Aircraft type rod ends with jam nuts and lock washers	tie rods
2	3/8″ Kart type rod ends with jam nuts and lock washers	tie rods
	Rear Axle and Drive	
1	1″ dia. x 36″ 7075-T6 alum. alloy	rear axle
2	3/4-16 thin self-locking nuts	rear wheels
2	1/4 x 1/4 x 1 1/4″ keys	rear wheels
2	Alum. drive flanges with 1/4 x 1/4″ keys	sprockets
2	Alum. 72 tooth sprockets	rear axle
12	5/16-24 x 1″ hex-head cap screws, nuts, and lock washers	sprockets
3	1″ *Fafnir* 2-bolt *Flangette* bearings	rear axle
6	5/16-24 x 3/4″ hex-head cap screws with self-locking nuts	axle bearings
2	*McCulloch* MC-6 (or MC-20) engines with mounts, air cleaners, 8 to 12 tooth sprockets	drive
8	5/16-24 x 1″ hex-head cap screws, with self-locking nuts and flat washers	engine mounts
6 ft.	#35 drive chain	drive
1	Alum. gas tank with 3 gas lines	
	Brake and Throttle	
2	1/4 x 3/4 x 8″ HR steel	pedal arms
2	1/8 x 2 x 3″ HR steel	pedal pads
90 in.	1/4″ dia. CR steel	brake & throttle rods
1	3/8″ x 12 3/4″ std. black iron pipe	brake cross-shaft
6 in.	1/8 x 1″ HR steel	cross-shaft arms
2 in.	1/2″ std. black iron pipe	cross shaft-spacers
1	1/4″ quick adjusting rod end	brake
2	1/4-28 clevis ends, pins, and cotters	brake & throttle rods
1	6″ dia. heavy duty brake unit	brake
1	brake drive flange, with key	brake
2	return springs	brake & throttle rods
6	1/4-28 jam nuts	brake & throttle rods
2	1/4-28 ball joints with self-locking nuts	brake & throttle rods
1	5/16″ dia x 23″ CR steel	throttle cross-shaft
1	1/8 x 47/8″ copper pipe	throttle stop
3	throttle arms	throttle
2	clamp-up bushings	throttle
2	1/16″ dia. x 15″ copper-coated gas welding rod	throttle
2	1/4″ flat washers	throttle
1	5/16″ flat washers	throttle
3	3/32 x 1/2″ cotters	throttle
	Body	
1	fiberglass body shell	
23	#10 x 1/2″ self-tapping screws	
9 ft.	rubber edge trim	
2	3 x 6″ corrugated rubber floor mat	
1	set upholstery	

NOTE: For prices on any of the above components write to Ison Engineering, 5203 Scenic Drive, South Bend, Indiana.

Many types of gas tanks are now available. We prefer the lightweight spun aluminum type that is attached to the seat back. Some karting clubs require a metal firewall, although the fiberglass is an excellent firewall itself. However, if it is required, cut a thin piece of sheet aluminum to fit inside the back of the fiberglass shell. Mount the tank over the aluminum according to the instructions furnished with the tank. This will hold the firewall in place. Drill a 5/8 in. dia. hole in the hump of the shell about 3/4 in. down from the top for the steering shaft to go through.



The Shell Is Now Ready to be mounted on the chassis. Place it on the frame and check for fit all around. It may be necessary to file off the inside corners of the frame at the 45° angle cut at the frame overlap. Before screwing the shell down, you may wish to finish off the edges of the fiberglass with a strip of rubber molding (Fig. 2). Mark screw holes on the shell as indicated, and "C" clamp the shell to the frame, using folded up pieces of cardboard under the clamps to prevent marring the finish. Drill 5/32 in. holes through shell and frame and insert #10 x 1/2 in. self tapping screws.



After the body is attached, shove the steering shaft up through the 5/8 in. hole in the shell. Check the shaft to be sure it is pulled up tight against the bottom bearing and place the steering wheel in position. Drill a 3/16 in. hole through wheel and shaft and insert a 3/16 x 1 in. roll pin.

Run the fuel line from tank outlets to carburetors, fill the tank and take off.

• Craft Prints in enlarged size for building racing karts are available at $1.50 each. Order by print number. To avoid possible loss of coin or currency in the mails, we suggest you remit by check or money order. (No C.O.D.'s or stamps). Now available our new illustrated catalog of "196 Do It Yourself Plans," 10(. SCIENCE AND MECHANICS, **450** East Ohio Street, Chicago 11, Illinois. Please **allow three to four** weeks for delivery.