

Here's What It Costs

For less than \$175, including a new engine, you can have Pow'r Pup rolling in your yard or garden. You can hold cost* below this figure by doing all the work yourself, or you can buy some of the harder-to-make components listed so that construction becomes primarily an assembly job. Your actual cost may therefore range from below \$175 to \$350, and your finished Pow'r Pup will be comparable to commercial garden tractors selling at 1500 to \$600.

Suburban Tractor

Will: mow the lawn—haul leaves—do light grading—bulldoze snow—roll the lawn—plow garden—pull a disc or harrow—cultivate crops—pull a seeder—**tow** a sled

By S. S. MINER

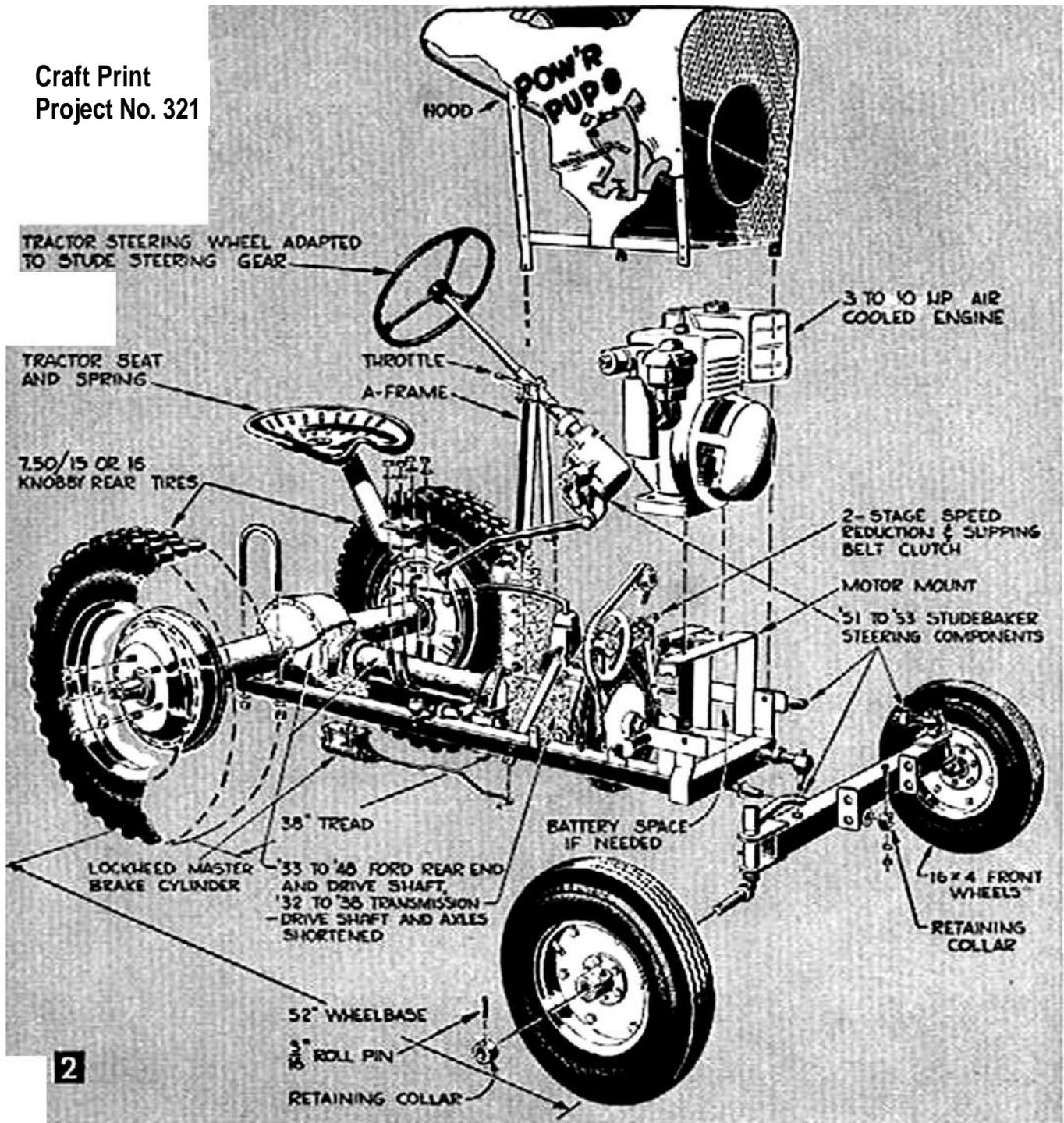
NOT a toy, but a real man-sized tool, the *Pow'r Pup* goes a step beyond the straddle-type tractors now in widespread use and brings to the home workshopper, for home construction, a rugged, simple, and economical machine for yard and garden work—and for leisure enjoyment too. Many Sears tractor attachments will fit *it and*, you can build it for \$175.00 or less.

Based on used car parts (widely available in junk yards) and various-components from Sears Roebuck Co it is extremely stable and

plier has been established for components you may wish to buy rather than make (see Materials List).

The design *is* flexible enough to permit a wide choice of automotive parts; you could base a small tractor design on almost any manual-shift transmission and symmetrical rear end, and many small air-cooled engines from 3 to 10 hp would be suitable. However, any departure from the design given here will require careful study of the problems involved. If you make changes, keep in mind that the ready-made parts listed will fit only the *Pow'r Pup* as designed. Your First Step in building the *Pow'r Pup* is to locate the used drive-train parts from The

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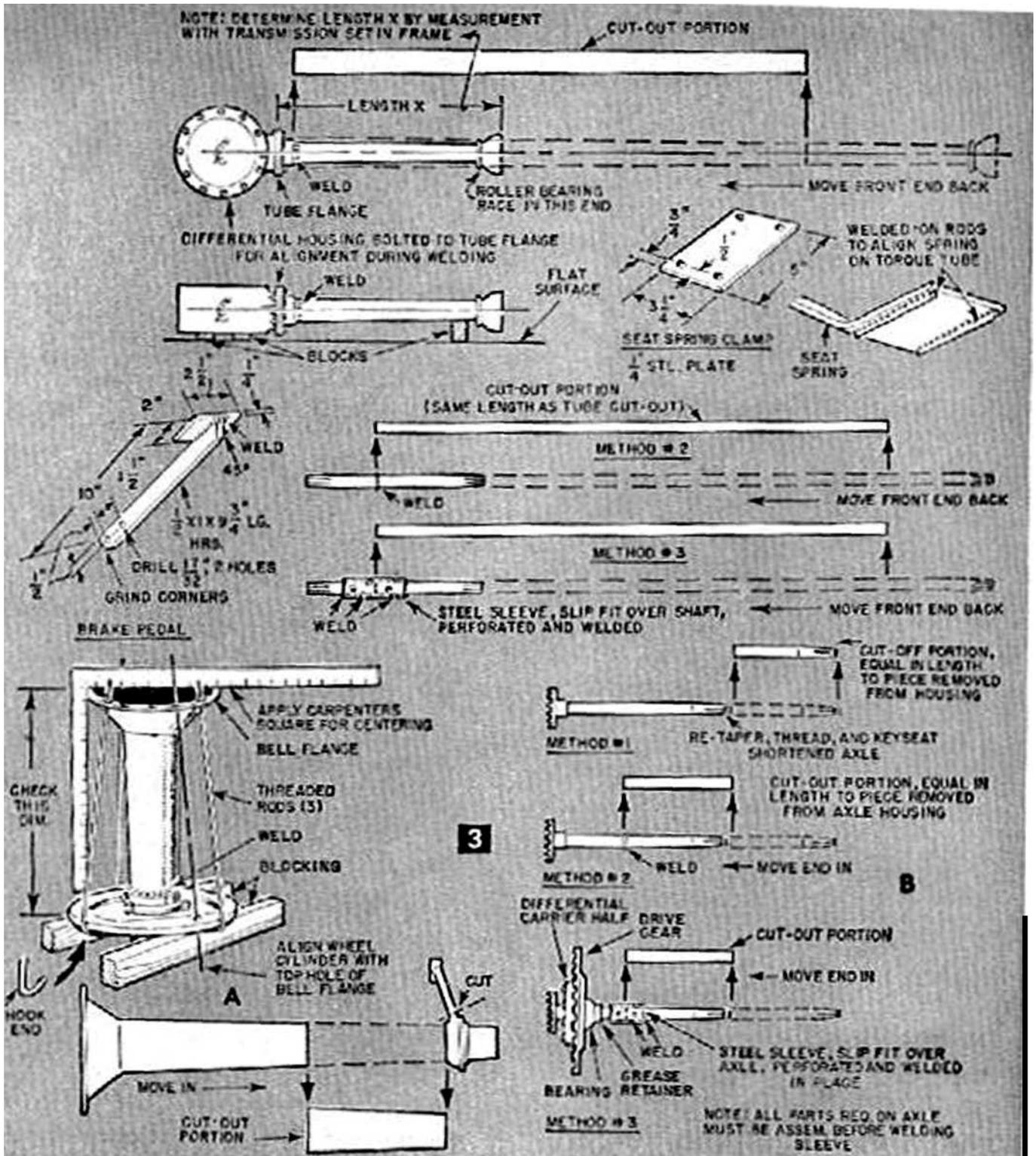


tial parts: a transmission, driveshaft and housing, universal joint and joint cover, and rear end complete with drums and internal brake parts. Lay all this loot out on the ground somewhere and clean off the outside (it will probably be pretty dirty) with a putty knife and kerosene, or use a commercial degreaser.

Before taking the parts into your workshop drain the rear end and transmission. Then remove the two axle housings from the differential housing. In these earlier Fords, the bevel pinion gear at the inner end of the axle shaft is forged directly on the end of the axle itself, hence the axle housing must

the rear end, clean up the axles and housings preparatory to working on them, and unfasten the backing plates and lay them aside.

First Job is to Cut the spring perch arm (Fig. 2B) off each axle housing. Hack saw it as close as possible to the housing bolting flanges. Then cut a section out of the axle housing itself close to the bolting flange (Fig. 3A) with a hack saw, or in a power cut-off saw if one is available. The amount to be removed will depend upon two things: the rear wheel tread of the original car, and the tractor wheel tread width desired. Half the difference between these two dimensions is the amount to cut out. Make these cuts at 90°



housing end to it. Support this, on blocking and clamp the axle housing in assembled position with three 1/4-in. rods, hooked at one end and threaded at the other (Fig 3). Check with a carpenter's square and steel tape to determine parallelism and proper centering of the backing plate and bell flange. Be sure to align the wheel cylinder opposite one hole of the bell flange so that when assembly is completed the wheel cylinders will be at the top on each side.

In either case, once proper alignment has been achieved, weld the two parts together, tack-welding first on opposite sides to avoid distortion. Shorten both axle housings in this manner.

There are Three Methods (Fig. 3D) for shortening the axles themselves: 1. Cut them off to the desired length, retaper and thread the ends, and 2. Cut a section out and butt-weld the remaining portions together, and 3. Cut a section out, slip a perforated sleeve over

slipped over the axle before the sleeve is welded on, and they can never be removed. The second method is best for those with the necessary welding skill but no lathe.

Choose the method best suited to your skills and tools, then shorten both axles by the same amount that you shortened the housings.

Similar problems will be encountered in shortening the driveshaft and torque tube. The front end of the Ford torque tube contains a roller bearing race; therefore the portion removed must be back of this, preferably at the rear end of the tube (Fig. 3). Bolt the rear tube-flange to the differential housing and lay the assembly on a flat surface to secure proper alignment while welding.

Since both ends of the Ford driveshaft are splined, the method chosen for shorten-

ing it will probably be #2 or #3 (above), rather than #1, to avoid the problem of resplining a cut-off end. The sleeve method will be satisfactory for this shortening operation as it will not interfere with assembly or disassembly. Remember to remove the same amount from the shaft as from the tube.

After the shortening operations are completed, coat all parts with a film of grease and reassemble. Now, before going further with the reassembly, check the brake drums, shoes, and cylinders—these will probably need reconditioning. Worn shoes can be re-lined or replaced (see Materials List), and scored drums can be turned at your local automotive repair shop. Finish the assembly of the rear end after overhauling the brakes,

Next Job is the Frame (Fig. 4). If you are going to take this part of the job to a com-

MATERIALS LIST—POWER PUP

STEEL	
Amt. Req'd	Size and Description
21 ft.	2 x 2 x 1/4" angle iron for frame, front axle, brackets
8 ft.	1/4 x 2" flat HRS for motor mount, spindle supports, brackets
1 ft.	1/4 x 4" flat HRS for steering bracket, seat clamp
9 ft.	1 x 1 x 1/4" angle iron for A-frame, axle stops, trans. bearing, loggie support
12 ft.	3/16 x 1" flat HRS for hood
20 in.	1/4 x 1" flat HRS for loggie, pivot pin pad, clutch
20 in.	1/2 x 1" flat HRS for clutch, brake
6 ft.	1/2 x 1 1/2" flat HRS for equalizer bar and support, clutch support, jack shaft parts
5/8 in.	1" round CRS for axle pivot pin
1 1/4 ft.	3/8" round HRS rod for hood, brake, clutch, steering
4 ft.	1/2" round HRS rod for U-bolts, seat spring stops
22 in.	3/4" I.D. x 1 3/8" O.D. tubing for spindle bushings and collars, steering adapter
1 in.	1" I.D. x 1 1/2" O.D. tubing for axle pivot pin collar
2 ft.	1/2" black iron pipe for steering rod extensions
7/2 in.	1 3/8" I.D. x 2 1/4" O.D. tubing jack shaft arm
MISCELLANEOUS PARTS	
1	60 tooth 1/2" pitch (40 chain) sprocket, Boston Gear #SKSB60 for drive, 2nd stage
1	15 tooth 1/2" pitch (40 chain) sprocket, Boston Gear KSB15-1 for drive, 2nd stage
40 in.	1/2" pitch, 40 single Boston Gear roller chain with connecting link for drive, 2nd stage
1	2 1/2" cast iron V-belt pulley, A size, 3/8" bore, Sears #9A2882 for drive, 1st stage
1	6" cast iron V-belt pulley, A size, 3/8" bore, Sears #9A2886 for drive, 1st stage
1	A-section V-belt, Sears #9A1630 for drive, 1st stage
6	Bronze thrust washers, Boston Gear #TV-1228 for spindles
2	Flanged bronze bushings, Boston Gear #FB-1012-6 for jackshaft
8	3/16 x 1 3/8" roll pins for adaptor, spindles
1	3/8 x 2 1/4" shoulder screw for jackshaft pivot
1	1/2 x 1" shoulder screw for equalizer bar pivot
1	3/8" bore self aligning pillow block Boston Gear type BNS (or similar) for trans. input shaft
2	speed controls, Sears #32F3020 for gas and choke
6	3/4-24 x 1 1/4" hex head screws for hood, steering brackets
6	3/4-24 x 2" hex head bolts & nuts for engine, trans., clutch
1	1" I.D. iron washer for axle pivot pin
1	1/4-20 x 2" hex head bolt & nuts for axle pin collar
4	1/2-13 x 1" hex head bolts and nuts for trans., steering
8	1/2-13 hex head nuts for U-bolts
36	#10-24 x 1/2" rh screws and nuts for hood, throttle
1	tractor seat, Sears #1415M

Amt. Req'd	Size and Description
1	tractor seat spring, Sears #1248M
1	tractor steering wheel, Sears #606A63
2	front wheels, 4 x 8 run. 16/4 tires and tubes, Sears #606H23
1	5.75 hp David Bradley engine, Sears #32A3067L or #32F9823L
2	3 x 3' aluminum sheet (plain, for hood) Sears #99A7320N
1	2 x 2" piece 1/2" expanded metal for grille
1	starter kit (if desired) for David Bradley engine including starter and battery, Sears #F32F9822L
USED AUTOMOTIVE PARTS	
1	'32-'48 Ford rear end, with brake parts and drums, torque tube, drive shaft, universal joint and cover
1	'32-'38 Ford transmission (or '39 to '48 side-shift model)
1	Lockheed (or similar) master brake cylinder with tee fitting and lines
1	steering gear (from '51 through '53 Stude) including shaft, gear box, pitman, connecting rod, tie rods, knuckle arms, six tie rod ends, and ends of intermediate arm
2	18" or 16" Ford wheels
2	7.00/15 or 16 tires and tubes (knobby thread preferred)
* Obtainable from Sears, also the following optional items: wheel cylinders, brake lining sets, brake lines and fluid brake drums, Alkyd spray enamel and primer, motor degreaser, motor oil, transmission grease, lights, switches, wiring, perforated aluminum (for grille).	

TRACTOR PARTS

Tractor parts obtainable from: Soley Speed Equipment, 1851-53 Prairie Ave., South Bend, Indiana—all prices include materials—F. O. B. South Bend—

Item	Price
Drive shaft: cut, re-splined	\$ 8.50
Drive shaft housing: cut, welded	8.50
Rear axle (R & L): cut, threaded, key-seated, threaded	10.50 ea.
Rear axle housing (R & L): cut, welded (incl. backing plate, but no brake parts)	10.00 ea.
Rear end center section: with gears (as is)	3.00
Front wheel spindle (2 req.): bent, welded-on washers, with bronze washers (3), retaining collars, & steering arm bushings	5.00 ea.
Front axle: weldment, with spindle bushings, clips, pivot bushing, retaining collar	15.00
Frame: weldment, with motor mount, crossbar, clips, holes	28.50
U-bolts: (2 rear axle, 2 seat)	2.00 ea.
Seat spring clip: drilled	1.75
Steering equalizer bar: bent, center pad welded and drilled, no rod end ears	3.50
Steering column adapter: tube, counterbored	1.00
Main drive sprocket: broached	12.00
Jackshaft arm and carrier: welded, slotted, drilled	5.00
Intermediate sprocket and pulley: shouldered, with sprocket bored and brazed on, bronze bushed	10.00
Implement hitch adapter: rear, angle iron, drilled and welded	5.00

mercial welding shop, you will save time and money if you get all parts cut to length first. Cut front axle parts at this same time, and do both welding jobs in one visit to the welder. Check the drawings to determine according to your facilities which holes in the various weldments you will drill before welding, and which afterwards. Take pains to get the frame corners square and the side rails parallel when clamping up; as there will be no way of correcting a crooked frame after welding. Note that in the boxed construction of the front cross member and the front axle, the angle iron flanged are lapped so as to keep a 2-in. vertical dimension through, these parts.

Before welding on the spindle bushing supports to the axle ends, make the spindle bushings (Fig. 4A) and position them in the supports when clamping up, to make it possible to check the spindle and caster angles.

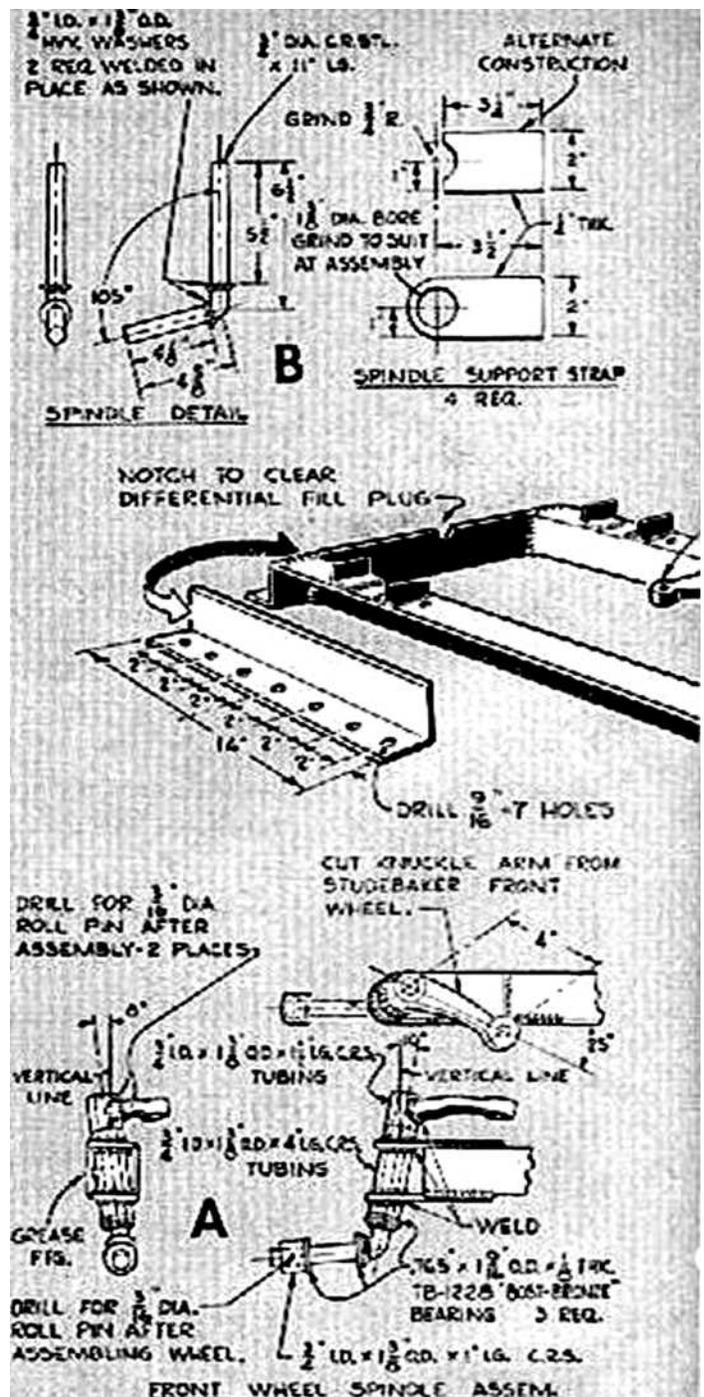
Bend the Wheel Spindles to a 105° angle (Fig. 4B), first heating them with a welding torch to a bright red at the point of bend. Then weld heavy steel washers to the spindle to form the shoulders (Fig. 4B). Weld the axle pivot pin to the front cross member, spaced from it with a 1/4-in. thick pad, so that the axle and front cross member will lie in the same plane. Slip the axle onto the pivot pin and secure the retaining collar with a 1/4-in. bolt (Fig. 4C).

It may be necessary to ream or hone out the spindle bushings because of distortion caused by welding. Make the fit of the spindle in the bushings fairly free, then drill and tap Zerck fitting holes in the rear sides of the bushings. Install the front wheels and spindles now, with brass thrust washers where shown (Fig. 4A), and fasten the wheel retaining collars with 3/16-in. roll pins.

Make the motor mount according to Fig. 4D for the Sears 5.75 engine—otherwise modify it to suit whatever engine you have chosen.

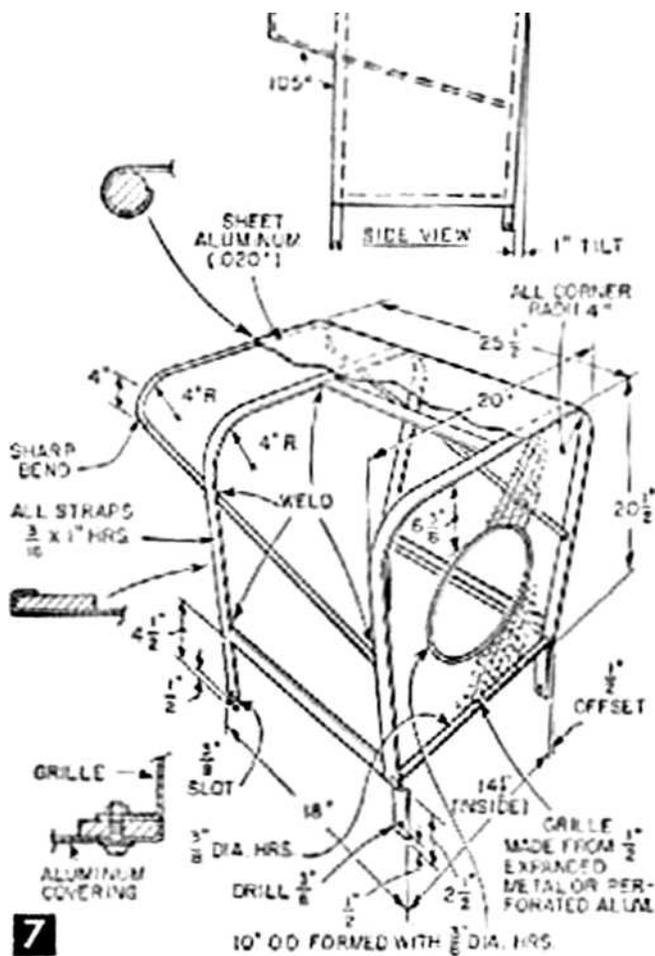
Prop the Rear End of the frame up at the proper height (10 in.). Notch the transmission bell with a hacksaw to clear the frame side rails (Fig. 5), then set the transmission in place. Make two short sleeves (Fig. 5) and secure them with 3/8-in. bolts (in the old clutch pivot holes in the transmission) to holes drilled in the tractor frame. These support the front end of the transmission. Its rear end is supported on two clips (Fig. 4D) and bolted there with 1/2-in. bolts.

Bring the rear end and driveshaft into position, engage the universal joint, and center up the differential housing in the frame. Jam four pieces of 1 x 1 x 1/8-in. angle iron under the tapered axle-housings and weld them in place. Mark and drill holes for the U-bolts (Fig. 4D), then fasten the whole rear



Make a clamping plate (Fig. 3) and secure the Sears tractor spring and seat on the drive shaft housing. Later you can slide this back or forward to get the best position. Heat the shift lever to a cherry red at two places, and bend it to the dog-leg shape shown in Fig. 2. You will have to cut off the end, too, and re-thread it for the shift knob.

Now for the Steering. The mechanism used was taken in its entirety from a 1052 Studebaker (any Stude, '51 through '53, has the right gear). Be sure to get the steering knuckle arms, both tie rods, the connecting rod, steering gear box, the end of the intermediate arm, and six tie rod ends. Cut the



position it on the mount according to Figs. 2 & 5. With other engines it will be necessary to check clearances on all sides of the engine and alignment of the drive pulley with the jackshaft pulley before drilling the mounting holes.

To avoid interference with the grille, make a diagonal extension for the air cleaner (Fig. 2) if your engine requires it

Make the Hood Frame (Fig. 7) of 3/16x1-in. HRS and 3/8-in. HRS rod bent and welded together. Cover it with sheet aluminum (see Materials List) carefully bent around the frame and secured at the bottom with #10-24 rh screws and nuts. Trim the metal far enough from the frame edge so you can form it around the frame members to finish off and secure it. Make the grille of 1/2-in. expanded metal, or perforated aluminum sheet, and secure it in place with #10 rh screws 1/2-in. long, and nuts.

Make a 10-in. diameter ring of 1/4-in. or 3/8-in. steel rod and braze it to the surface of the grille, centering it laterally and positioning it vertically so as to clear the starting mechanism of the engine. Then cut out the portion of the grille inside the ring, hammer down the cut edges and cover them with braze where necessary. If your grille is aluminum, simply trim it about 3/4-in. inside the ring. And form it back over the ring.



With a 5.75 hp engine, the Pow'r Pup makes light work of a heavy job, turning an 8-in. wide furrow 8-in deep in medium sod with the Sears 6-in plow.

Place the Hood in position on the tractor and push it backward far enough so the starter mill rope is freely accessible through the grille opening, then mark for, and drill and tap, the hood pivot-bolt holes (Fig. 4D). Then locate and bolt on (or weld) the rear hood support clips (Fig. 4).

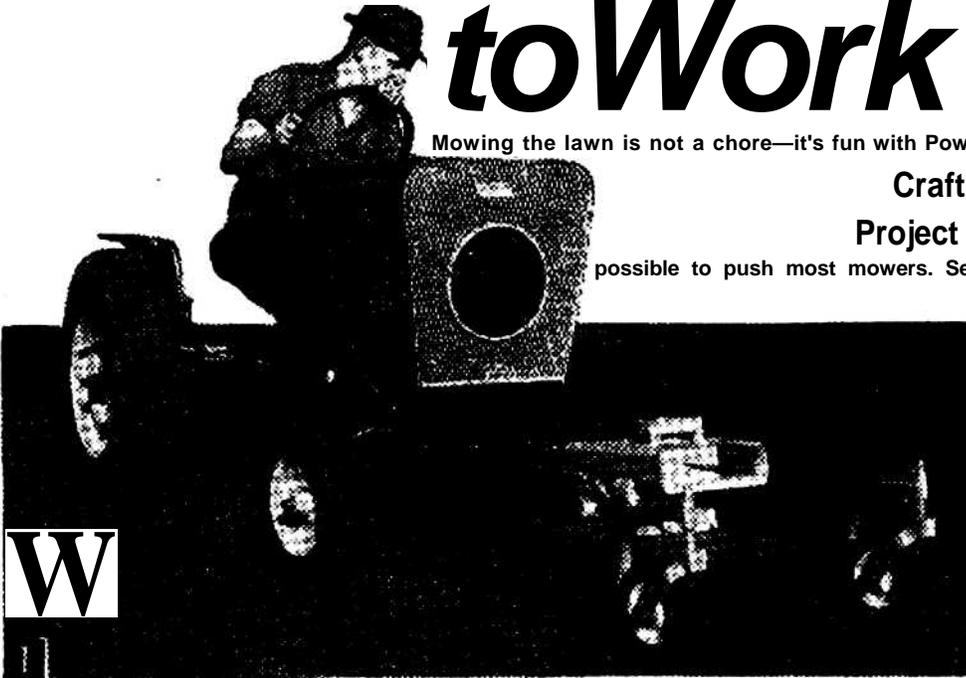
Make the brake pedal (Fig. 3), of 1/2 x 1-in. HRS and pivot it to the right side of the frame. Mount a Lockheed (or similar) master cylinder well back on the frame and make a 3/8-in. diameter brake push rod to connect the pedal with the cylinder. Connect the master cylinder by means of regular steel tube brake line, including a tee fitting, to both rear wheel brake cylinders.

Install a throttle control (see Materials List) on the A-frame and connect it to the engine carburetor. Use a similar control for the choke, if desired.

This Completes the Mechanical Work on the Pow'r Pup. Now clean up the whole machine and paint it with good quality machine enamel (see Materials List). Before starting the tractor, service it completely.

Next month's article will tell how to make and use the various attachments the Pow'r Pup is designed for.

Putting Pow'r Pup to Work



Mowing the lawn is not a chore—it's fun with Pow'r Pup. Castering wheels make it

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possible to push most mowers. Separate mower engine is a great advantage when working around trees and when backing up. The mower keeps on cutting, regardless of tractor speed.

Part 2

plows, mowers, and other gardening tools already on the market, many of which are available second hand. For lawnmowing, either pull or push-type reel

WHEN you have completed the mechanical work on Pow'r Pup, as described in August *SCIENCE and MECHANICS*, there is one additional feature, the rear wheel fenders, that should be added. These protect you from being jostled against the wheels when riding on rough or muddy ground.

Make them out of 1/2-in. black iron pipe (Fig. 5A), covered with sheet metal. After cutting the pipe to the required lengths, bend the four long pieces with a plumber's hickey to the radius shown. File or grind the ends of the transverse pieces to fit between the curved upright members and weld them in place.

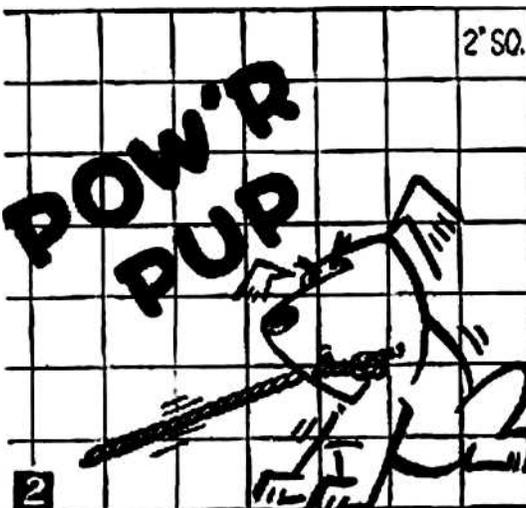
Make the four 1/4x2-in. hot rolled sled clips and bolt them to the bottom ends of the fender frames. Then weld the clips to the brake backing plates, positioning the top pipe of the fender frame about 1 in. above the tire. Cover the frames with 16 gage black iron sheet, securing it with #10x1/2-in self tapping screws. Smooth up all rough edges on the fenders, then paint them to match the tractor.

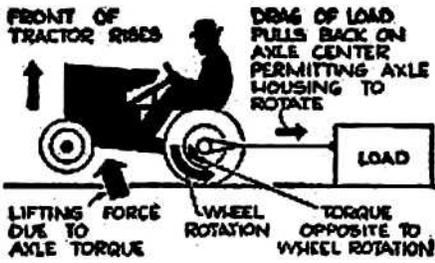
You Can Use Pow'r Pup with a variety of

mowers or rotary mowers can be adapted for use. Fig. 1 shows a Sears Roebuck 24-in. rotary mower attached to the front axle of the tractor with the hitch in Fig. 5C Several Sears mowers can be used with this hitch or with slight modifications of it.

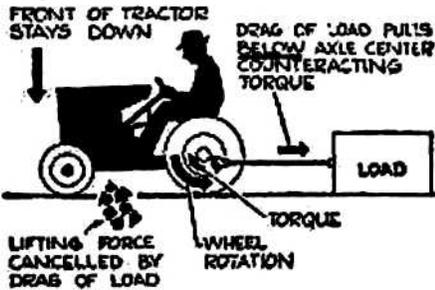
Make this hitch of 2 x 2 x 1/4-in. angle iron, cut, drilled, and welded as shown. Attach the Sears mower to it with the 1/4 x 2-in. HRS strap. The clamping plates (Fig. 5C) permit the mower to be lined up with either the left or right

wheels of the tractor for cutting along shrubbery and walls. The front end of the Sears mower is supported with two castering forks and brackets (see Materials List) bolted to the holes originally provided for the adjustable mower wheels. The mower wheels themselves can be mounted in the forks, using 3/8 in. bolts as axles. Lead the mower throttle control back to a convenient point on the hood, as seen in Fig. 1. Rear-Attaching Imple-

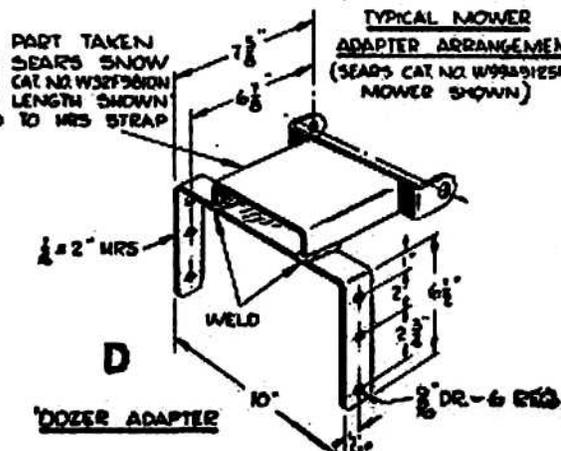
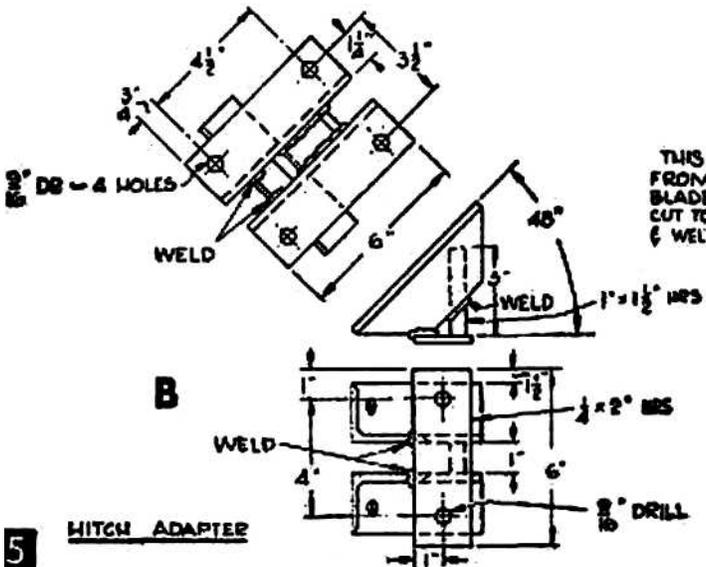
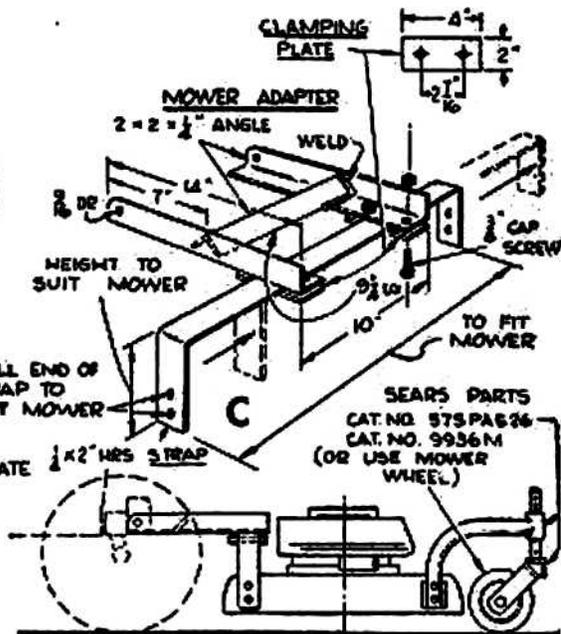
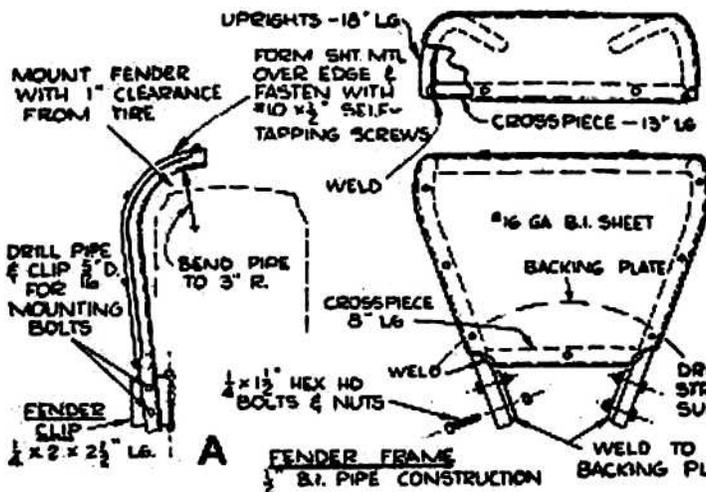




NEVER — HITCH LOAD TO AXLE HOUSING



3 **ALWAYS** — HITCH LOAD BELOW AXLE TO TOW BAR



5 **HITCH ADAPTER**

DOZER ADAPTER



Small-scale forming is well within the scope of Pow'r Pup. You can plow over an acre a day, and disc it too, doing a first-class job of seedbed preparation.



Thorough discing breaks up the clods so small rootlets can get a start. Note the straightened lifting handle. Pulling it forward lifts the implement (plow or disc) when turning at the end of the row.

ments should be hitched to the tractor tow bar (Fig. 3). If you wish to use Sears garden tractor implements, make the adapter shown in Fig. 5B, which provides the sloping surface required by the Sears implement hitch. Mount the adapter on the center of the tow bar for most implements, but toward the right side for the plow, so the right wheels of the tractor will run in the old furrow, while the plow-share cuts a new furrow and throws the dirt directly behind the right wheel (Fig. 6).

It will be necessary to straighten the handle of the Sears implement hitch so it will miss the right fender when the handle is swung forward. Do this with a welding torch, or simply cut off the bent part with a hacksaw.

To use the Sears bulldozer with Pow'r Pup, make the adapter (Fig. 5D) using a piece of the Sears 'dozer hitch with a welded-on strap. Bolt this to the implement clips on the tractor front axle. Bend the 'dozer operating handle to the right to clear the tractor hood (Fig. 4).

For a Decorative Finishing Touch, add the Pow'r Pup emblem to the sides of the hood, following the 2-in.-sq. layout in Fig. 2. Reverse the design (except for the name) on the left side of the hood so the Pup will be pulling forward.

Whatever you use Pow'r Pup for, remember it is a real machine, not a toy. Study Fig. 10 to see why it is necessary *always* to hitch pull-loads below the axle center. Most instances of turning tractors over come from ignoring this simple rule. Pow'r Pup, with its low-slung weight and spread-out wheelbase, is a very stable tractor, much more so than the average straddle-type garden tractor with its high center of gravity. So use care and common sense, and you will derive years of pleasure and service from Pow'r Pup.

MATERIALS LIST

No. Req.	Description	Use
4	1/2" black iron pipe 18" long	fenders
2	1/2" black iron pipe 13" long	fenders
2	1/2" black iron pipe 8" long	fenders
4	1/4 x 2" HRS 2 1/2" long	fender clips
2	16 us. black iron 15 x 15"	fenders
24	#10 x 1/2" self tapping screws	fenders
8	1/4 x 1 1/2" hex head bolts and nuts	fenders
2	2 x 2 x 1/4" angle iron 6" long	rear hitch
1	1/4 x 2" HRS 6" long	rear hitch
1	1/2 x 1" HRS 3" long	rear hitch
2	1/2 x 1 1/4" long hex head bolts and nuts	rear hitch
2	2 x 2 x 1/4" angle iron 14" long	mower adapter
	1/4" angle iron 6 1/2" long	mower adapter

Sears Implements Useable with Pow'r Pup

*24-in. Mower (or similar style).....	W99A9125N
*6-in. Plow.....	W32F9812N
*30-in. Disc Harrow.....	W32F9813N
*42-in. Snow Blade.....	W32F9810N
34-in. Drag Harrow.....	W32F9814N
Straddle-Row Cultivator.....	W32F9817N
*Caster fork and bracket (one RH, one LH req'd).....	575PA526
— from 32F54SIN mower —	
Caster wheels and tire (2 req'd).....	9936M
*2-point mowing hitch.....	W32F9811C