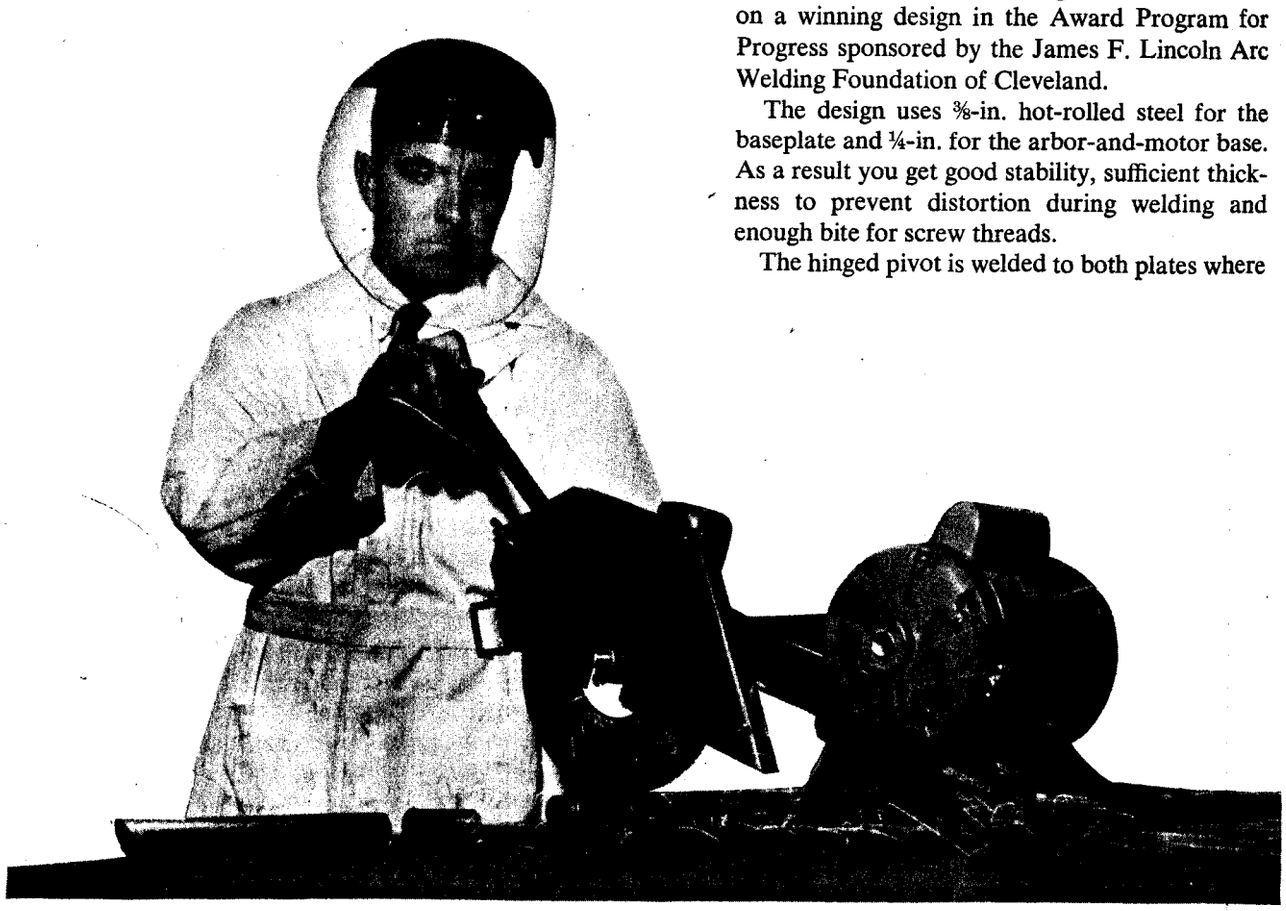
Build an abrasive cutoff wheel

BY RONALD S. WALKER

Here's a useful addition to your workshop equipment based on a winning design

cutouts, animal: see gifts, Christmas
cutouts, identical: see woodworking
cycles: see motorcycles

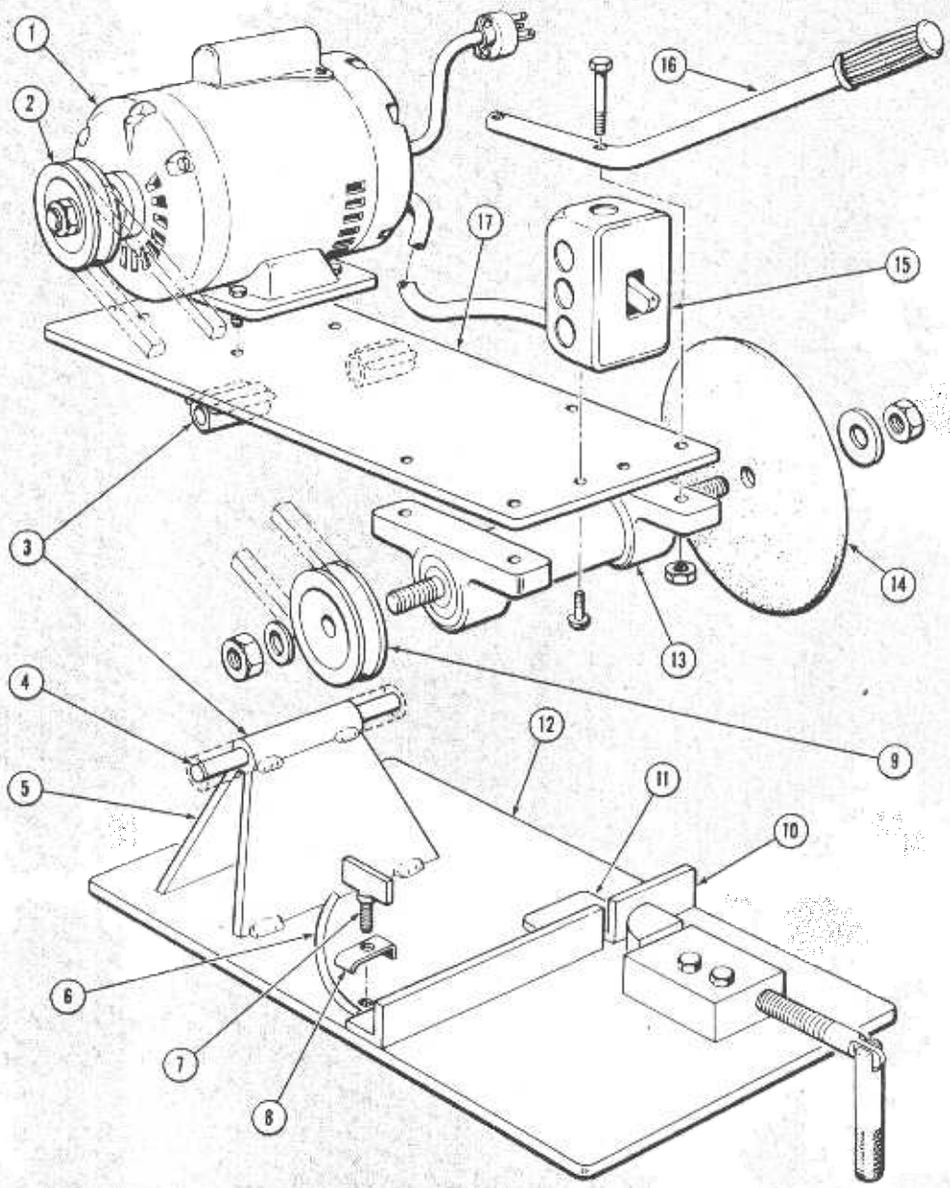


YOU CAN ZIP through steel with this portable abrasive cutoff saw in a fraction of the time it takes with a hacksaw.

It's relatively lightweight and you can make it with a minimum of machining. The tool is based on a winning design in the Award Program for Progress sponsored by the James F. Lincoln Arc Welding Foundation of Cleveland.

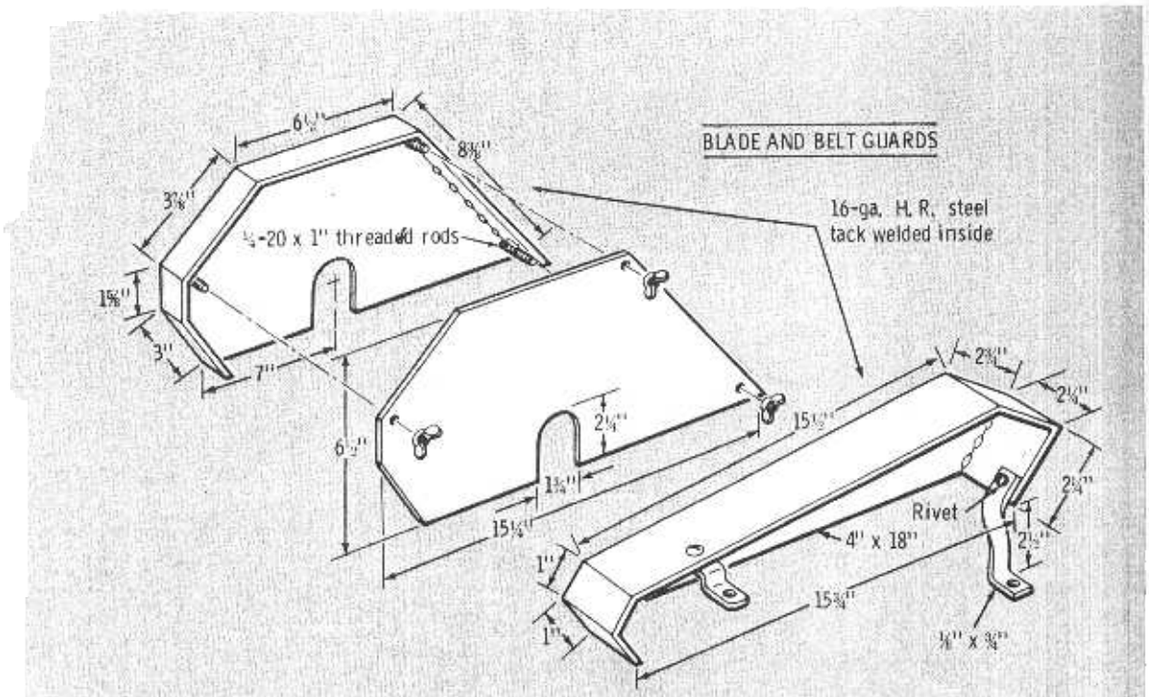
The design uses ⅜-in. hot-rolled steel for the baseplate and ¼-in. for the arbor-and-motor base. As a result you get good stability, sufficient thickness to prevent distortion during welding and enough bite for screw threads.

The hinged pivot is welded to both plates where

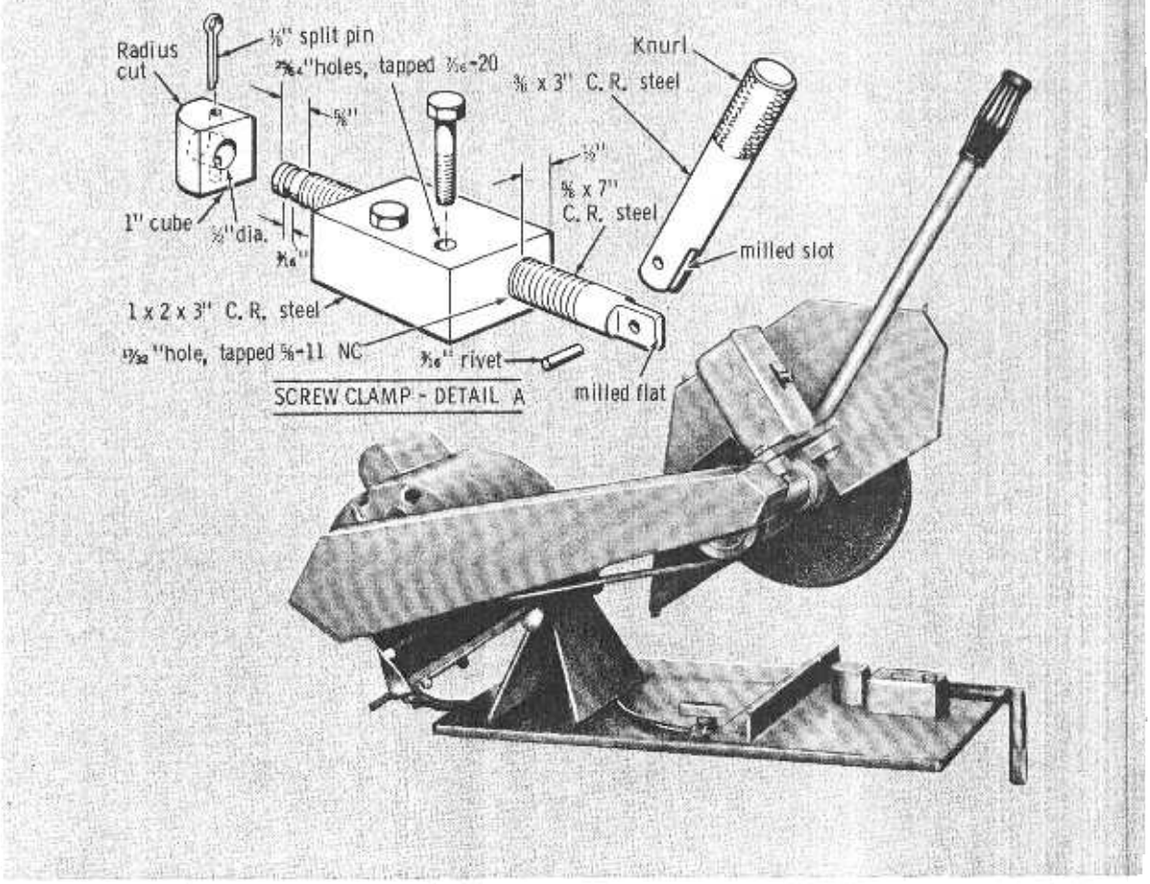


1 1-hp, 115-v, capacitor motor
2 2½″ A pulley
3 ⅜ x 6″ pipe
4 ½ x 6″ C.R. rod pivot
5 3/16 x 3¾ x 6″ H.R. steel (2)
6 ¼ x 11″ C.R. rod fence guide
7 ⅛ x ½ x 1¾″ H.R. steel brazed to ¼ x ½″ capscrew
8 ⅛ x ½ x 1⅝″ H.R. steel floating clamp
9 2½″ A pulley
10 3/16 x 1½″ steel angle fence
11 3/16 x ¾ x 2¼″ H.R. steel bridge
12 ⅜ x 10 x 18″ H.R. steel baseplate
13 Sealed ball-bearing mandrel, ⅝″ shaft
14 1/16 x 10″ resin-bonded abrasive blade with ⅝″ center
15 Grounded single-pole switch
16 ⅜ x 18″ pipe
17 ¼ x 6½ x 17¾″ H.R. steel

C.R.-cold-rolled H.R.-hot-rolled



build an abrasive cutoff wheel, continued



the weight of the motor will only slightly overbalance the weight of the arbor end of the assembly. For this reason, make the hinge, but do not weld to either plate until after the mandrel, blade, guards, handle and switchbox are at least temporarily mounted.

pipe for pivot assembly

The pipe used for the pivot assembly is ⅜-in. nominal size. Since this gives you an actual inside dimension of .489 in., it has to be drilled or reamed out to slightly over ½ in.

Run ¼-in. fillet welds from the sheet-steel pivot supports to a 3½-in. section of the pipe, using ½-in.-long skip welds to prevent distortion. For this and for welding to the plates, I used a ⅛-in. Fleetweld 37 E6013 electrode at 130 amps. Later, weld the 1¼-in. outer pieces of pipe to the arbor plate. Then the pivot rod can be inserted through the three sections of pipe. A punch mark in the center section will lock the pivot rod.

The one side and the top spacer strip of each guard are tack-welded on the inside about ¾ in. apart with a ⅛-in. E6011 electrode. Finish the outside corners of the joints smooth on a belt grinder or with a file. Then you can weld the blade guard to the arbor plate. Threaded ¼-20 rods are welded inside as indicated to receive a cover plate held with wingnuts.

You may weld or bolt the tabs on the belt guard, but the lower ends should only be bolted to the arbor plate in order to facilitate changing the belt.

bolt operating handle

Bolting the operating handle instead of welding it to the arbor plate permits its removal for more compact storage.

At the rear of the 10-in. angle iron that forms your fence and centered 7½ in. from the left end, weld and grind flush a ¾ x 2¼-in. tab of 3/16-in. steel. When the blade is used to slice through the fence after assembly is completed, this "bridge" will hold the two halves of the fence together. Drill a 7/32-in. hole 7 in. from the same end and tap it for a ¼-28 capscrew. This is a pivot, since we are now going to provide for adjusting the fence for miter cuts.

First, bend ¼ x 11-in. rod to a 6⅞-in.-radius arc and weld one end to the rear of the left end of the fence. This is a clamping guide. Now, position the front edge of the fence 7¼ in. from the front edge of the baseplate and scribe the plate at the left in front of the fence to facilitate resetting the fence square.

For the floating miter clamp, bend a strip of ⅛ x ½ x 1 1/16-in. hot-rolled steel so as to make one leg with 3/16-in. clearance under it and the other with ⅛-in. In the center of the horizontal, drill a 7/32-in. hole for a ¼-28 x ½-in. capscrew. Drill and tap a hole ¼ in. behind the fence and ¼ in. to the right of the curved rod to receive the capscrew. To turn it into a thumbscrew, braze a ⅛ x ½ x 1¾-in. steel tab to the top of the capscrew.

optional work clamp

The one part that requires machining is the work-screw clamp, which is not essential to make. One end of the threaded steel rod requires a ½-in. flat milled on it to mate with a milled groove on the handle so that the latter may be pivoted to clear the baseplate.

More important is the other end of this screw, which must be retained in the clamping-block hole, yet turn in it. Reduce the end of the rod to ½-in. diameter for ⅝ in. Mill a ⅛-in. groove ⅛ in. back from the tip. Then drill a ½-in. hole ⅝ in. deep in the clamping block and a ⅛-in. hole in the top of the block. This hole must intersect the ½-in. hole at one side and ⅛ in. from its bottom. A split pin inserted from the top will ride in the milled groove as the screw turns but will prevent the screw from withdrawing when the clamp is backed off.

baseplate stop for wheel

A steel bar can be welded to the underside of the arbor plate to stop the lowered abrasive wheel after it just nicks the baseplate. With limited use of the tool, however, it would take a long time before the baseplate will be cut through, since the motor will stall if forced into too wide a cut in the baseplate. At the time the wheel does cut through the plate, the slot could be welded shut and then ground flush.

Finally, note again that this tool is easily operated and will efficiently cut through steel. But the ease of cutting can be misleading. It is essential that you wear goggles or a safety face mask while cutting with it, even though you feel that a quick and easy cut is completed so fast that you hate to waste the time of putting them on.

One of the marks of a good craftsman is strict adherence to common rules of safety in the home workshop.

See also: circular cutters; dial indicator; inlaying; keyways; sheet metal; shrink plate; stake plate; tapers, lathe.