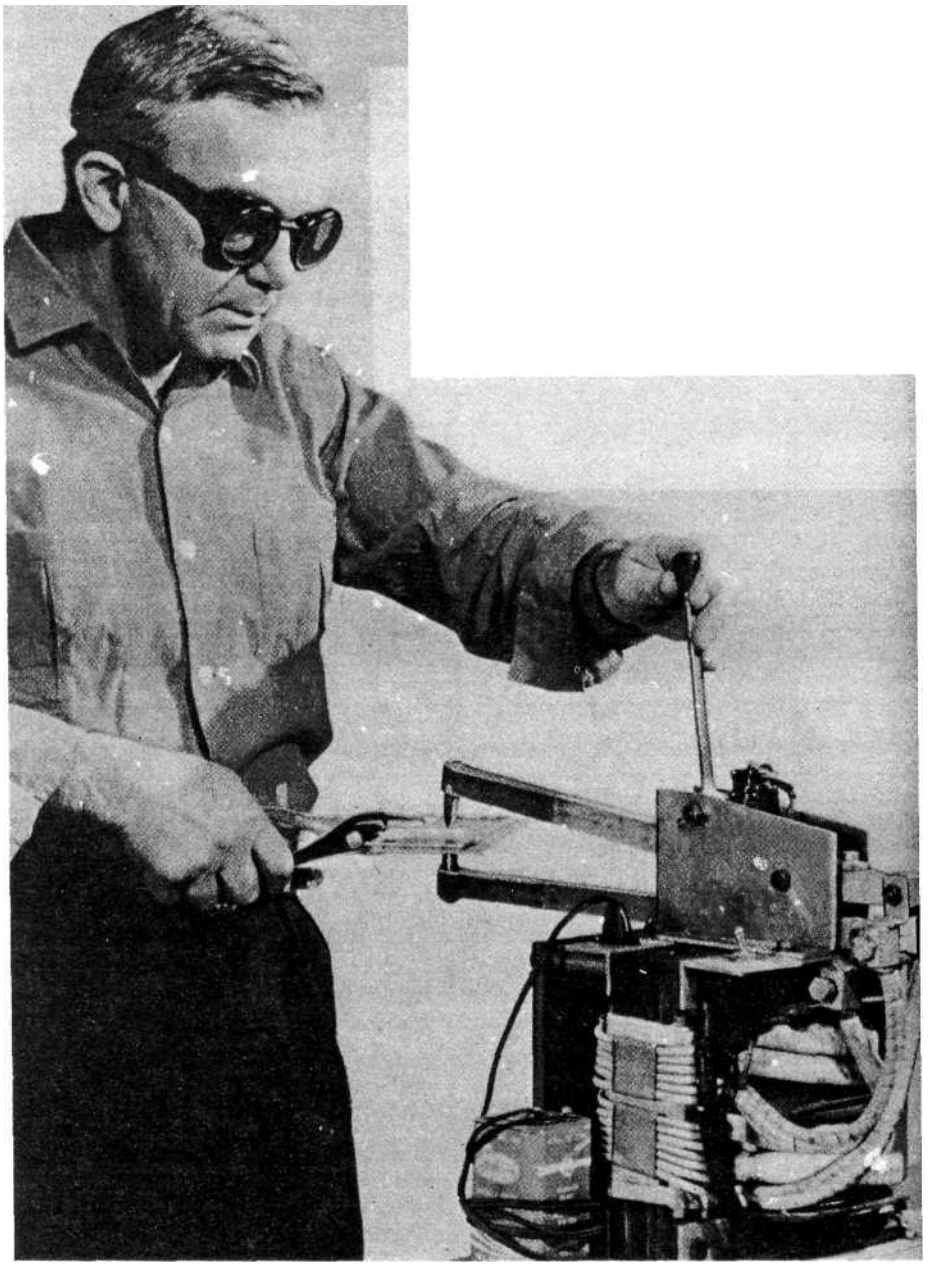
Spot welder works three ways

By J. NAUTA and J. FERRY

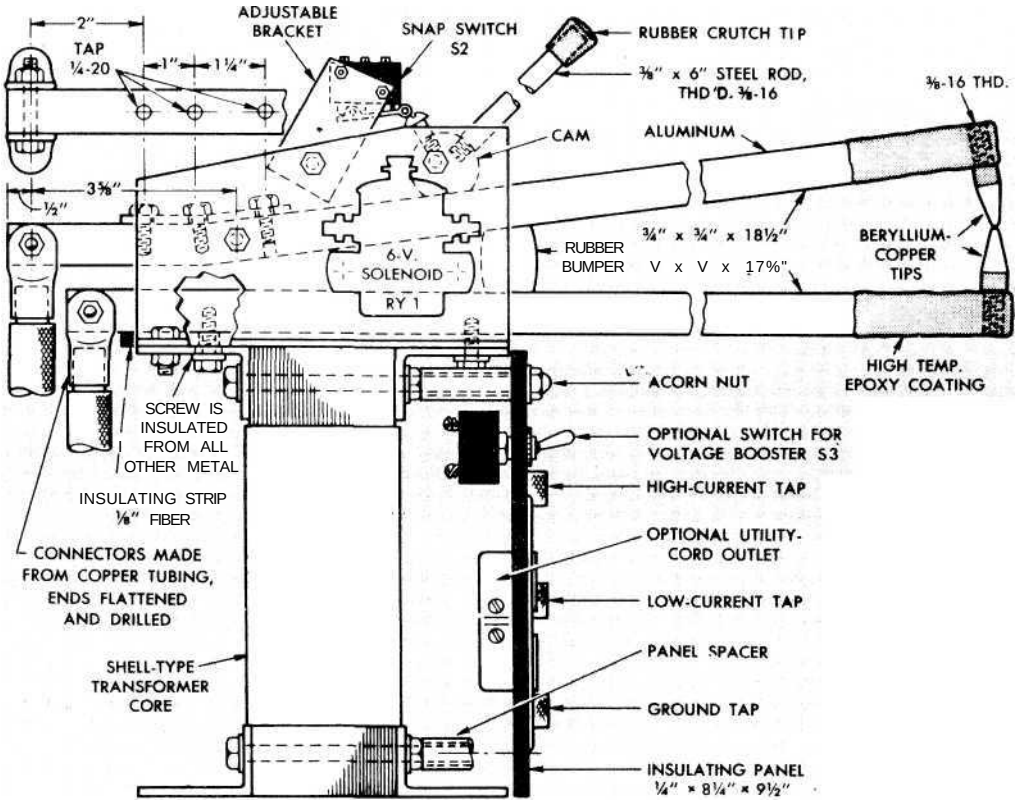
For just a few dollars you can quickly build this combination unit that will join ferrous metals and is cool enough for stainless steel



As A SPOT WELDER this combination unit will join ferrous metals up to 3/32 in. thick. It works especially well on stainless steel due to low heat and electrical conductivity of this metal. For heavier work it is used as an arc welder. A carbon-arc torch may be plugged in and used for brazing, silver soldering, aluminum welding and welding thin sheet metal as well as heating metals for bending. The voltage booster can be used to eliminate power-robbing voltage drop when portable electric tools and equipment must be used on a long extension cord. The voltage booster requires no extra coils, only a switch and receptacle connected into the circuit.

The original welder was operated on 115-v. circuits without damage to wiring of service box. Miniature 30-amp circuit breakers are substituted for ordinary fuses which won't take the momentary heavy current surges.

The shell-type transformer core used on the original welder was purchased from a dealer in scrap metals. The core should weigh about 30 lb.



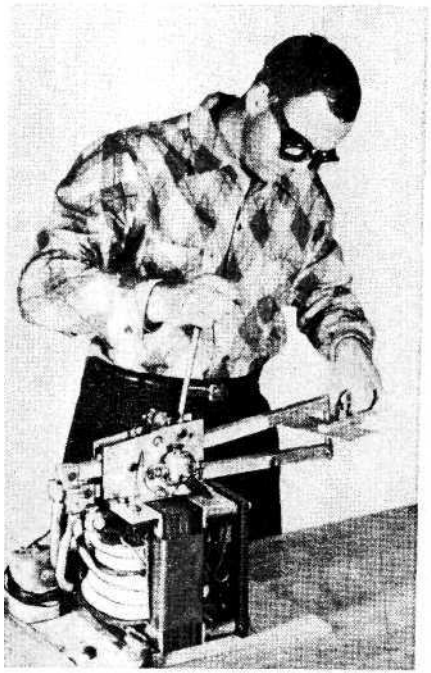
and the cross-sectional area of the main center leg should be at least 6 sq. in. or slightly more. There also should be about 2 in. of space separating the legs so there will be room for the coils.

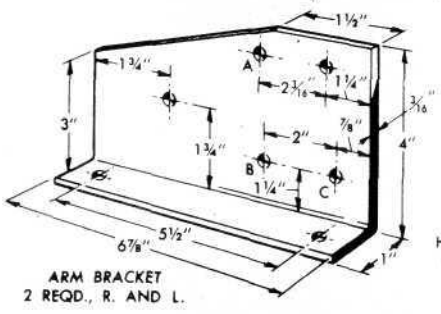
A wooden form slightly larger than the center leg of the core will be needed for winding the primary and secondary coils. The primary and secondary should be wound adjacent to each other with an insulating separator between. They may be wound one on top of the other but this will make it more difficult to control the arc-welding current. For operation on 115 volts the primary consists of 104 turns of No. 10 magnet wire. For operation on 230 volts, 208 turns of No. 13 magnet wire should be used. When winding the coils, thin fiberglass cloth and polyester resin are used as insulation between the layers of wire and also to wrap the coils.

The arc-welder secondary requires 42 turns of No. 6 wire while the spot-welder secondary consists of a double strand of No. 00 flexible welding cable, three turns, the ends of which are connected directly to the spot-welder arms with heavy copper lugs. Three strands of No. 4 cable could be substituted for each No. 00 cable if necessary. If there is a lack of winding space, it will be necessary to strip the heavy rubber insulation from the cables and wrap the bare wires together with adhesive tape. This winding is put in place after the transformer laminations are assembled and permanently clamped together.

The reactor, which is wound on one of the outside legs of the core after assembly, consists of 14 turns of No. 8 rubber-covered wire. This coil is connected in series with the arc-welder secondary to oppose the welding current. As the reactor is wound on the outside leg of the core, 14 turns are necessary to reduce the welding voltage by 7 and the welding current is reduced about 40 percent as the heavy current flowing through the reactor greatly reduces the magnetic flux flowing through the leg on which it is wound.

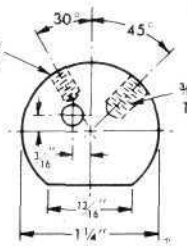
The spot-welder arms can be made of 3/4-in. square aluminum or copper. Brass is not suitable as it will quickly overheat. The lower arm is mounted directly on the transformer top as in the details and is insulated from it with a piece of 1/8-in. fiber. The mounting screws must also be insulated with fiber washers and short lengths of fiber tubing as in the pulled-apart detail. No





ARM BRACKET
2 REQD., R. AND L.

HOLES A, B AND C
OMITTED ON R.H.
BRACKET



CAM, ⅜" C.R. STEEL

insulation is necessary for the top arm and when mounted, it is grounded to the transformer frame and core. A rubber bumper forced between the two arms serves as a spring to open the arms when the cam handle is moved back. Beryllium-copper electrodes for the spot welder should be about 1/2 in. in diameter and about 2 or 3 in. long. The tapered shank may be cut and threaded 7/16 in. to turn into tapped holes in the welding arms. The holes in the arms should be drilled at a slight angle to cause the points of the electrodes to close at an angle rather than in line. The arms should be coated for a distance of about 6 in. from the ends with a heat-resistant epoxy cement to prevent sparking and burning should the work accidentally touch the arms.

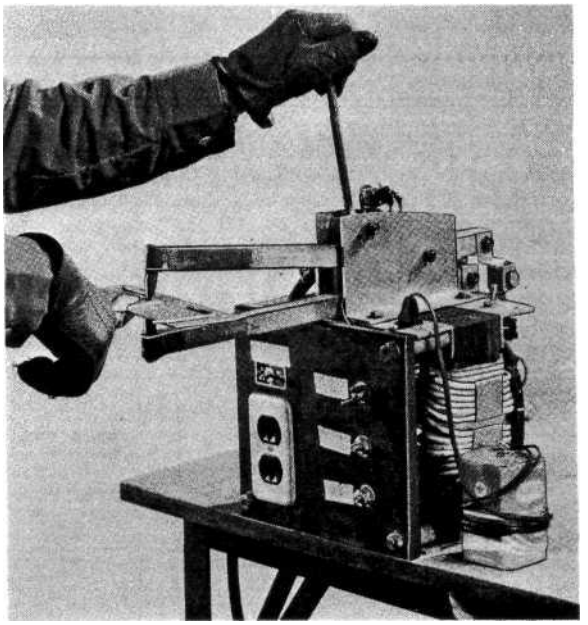
need auto-starter relay

An auto-starter relay is needed to control the momentary heavy surge of current when the spot welder is turned on and off. The top cover is removed, drilled through the center and reamed out to about 3/4 in. This allows the solenoid armature to open about 3/8 in. and stops arcing at the contacts. A rubber button is cemented to the exposed end of the armature and serves as a push button for manual operation. Automatic electric operation of the relay is also provided by connecting a 6-volt battery and snap switch in series with the solenoid winding. The switch is actuated when the cam handle is moved. The switch must be adjusted to close after the work is held firmly between the electrodes. It should open just before the electrodes release the work to prevent sparking and burning.

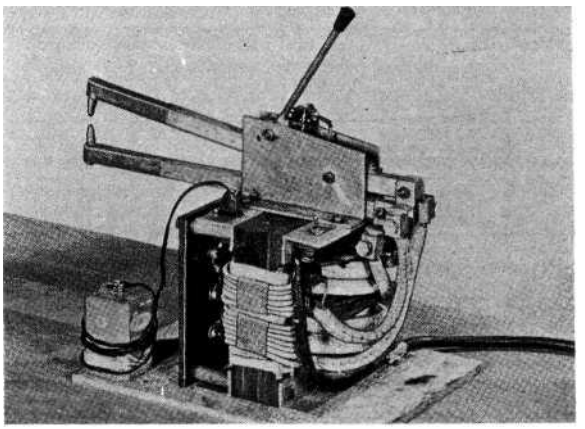
The arc welder has two heat ranges, high, which is over 100 amp with 1/8-in. a.c. electrodes, and low, which gives about 60 amp with 3/32-in. electrodes. Don't tap the arc secondary for lower current ranges as this will increase, not decrease, the current draw. With a shell-type transformer the orthodox magnetic-leakage method of current control cannot be used, so a reactor is used to decrease the magnetic flux through one leg of the core when the low range is plugged in. The reactor, of course, is connected to oppose the main secondary.

This welder is designed only for intermittent use, such as it would get in the average small shop. If it is used for too long a period at a time, the 30-amp circuit breakers will trip.

When first testing out the transformer the primary should be checked for no-load current input. This should be 1 amp or less.



Switches and taps on insulating panel should be labeled for easy identification and to prevent error. Do this with masking tape and a pen



A 6-V. battery provides automatic operation of the relay. Relay also can be operated manually. Drawing below shows the wiring diagram of welding unit